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FACTORY

MANAGEMENT AND MAINTENANCE

SEPTEMBER 1947

SPECIAL REPORTS

What's Happening to Productivity 66
How Personnel Men Think the Labor Law Will Work 84

EDITORIAL

In Britain and France the Need Is More Output per Man-Hour 65

PRODUCTION

Revamped Shipping Layout Cuts Cost 10 to 30 Per Cent 70
Job Instruction Sheets Increase Output per Man-Hour 72
Palletizing Permits Stockpiling for Quick Shipment 82
Cases in Work Simplification 97
Lead-Time Chart Insures Close Scheduling 122
Conveyorized Handling Pays Its Way in 60 Days 124
Responsibility for Establishing Time Standards 134

MAINTENANCE

Modernized Foundry to Make It a Better Place to Work 74
Oil Reclamation System Paid for Itself the First Year 78
Better Lubrication at Two-Thirds the Old Cost 100
Maintenance Budget Matches Manpower and Work Load 106
How to Maintain Motor-Driven Rheostats 118
Master Switches—What They Are and How to Service Them 126

INDUSTRIAL RELATIONS

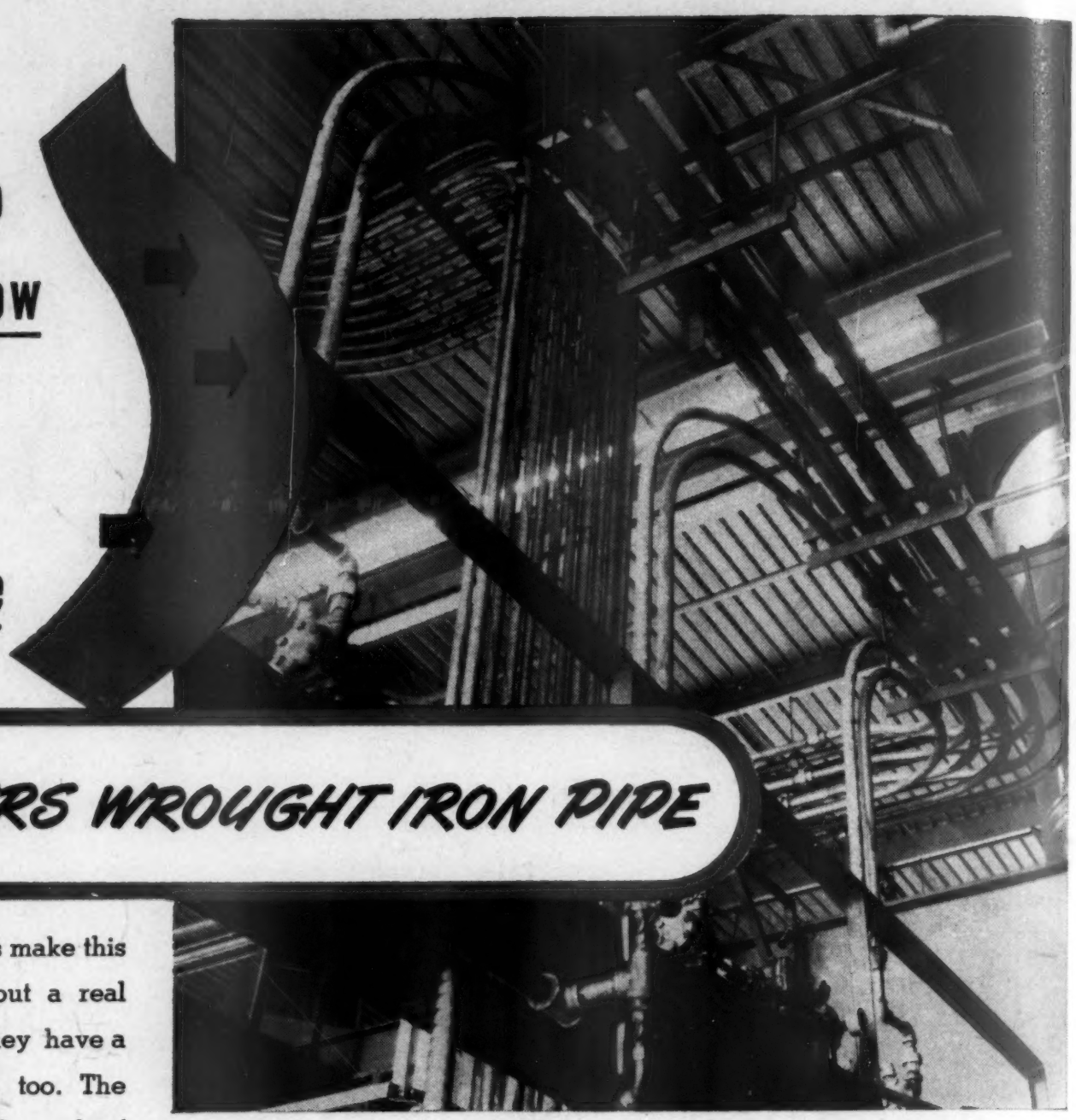
Wage Rates in Manufacturing, U.S., 1941, 1945, 1946 77
Educating Workers in Safety Reduced Lost-Time Accidents 103
Better Vision—*Plant Operation Library No. 10* 109
A Plant Hospitalization Plan With Unusual Coverage 117
Chairman Gives Foremen Basic Economic Facts 129

DEPARTMENTS

Looking Ahead in Labor, 128 • Looking Ahead in Business, 120 • Operating Shorts, 131 • What's New in Equipment, 138 • You Want to Know, 208 • Significant Labor Developments, 220 • They Say and See, 232 • Behind the Byline, 252 • Books and Booklets, 266 • On the Calendar, 272 • Catalog Service, 284

A McGRAW-HILL PUBLICATION

Designed to increase flow and to reduce maintenance



BYERS WROUGHT IRON PIPE

Smooth sweeping curves make this paint spray piping layout a real work of art . . . but they have a very practical function, too. The absence of sharp bends and of fittings means unimpeded, low resistance flow, and no pockets to entrap and hold material. Practical considerations also dictated the choice of piping material, which is Byers Wrought Iron. The unusual corrosion resistance of wrought iron makes it a favored material for a wide variety of responsible jobs.

The installation was made in an automobile assembly plant at Kansas City, Kansas. The pipes shown are duco spray lines at a body booth and are a part of a Binks Circulating System. E. W. Lochman Plumbing and Heating Company of Kansas City, Missouri handled the piping installation.

Providing and maintaining process piping is a complex job, because of the variety of fluids that must be handled. Whenever corrosion is a factor, Byers Wrought Iron deserves careful consideration. Its unusual structure and composition—tiny fibers of glass-like silicate slag threaded through a body of high purity iron—halt and "detour" corrosion, and also help to anchor the initial protective scale, which shields the underlying metal. You can get an idea of its widespread use from our bulletin, "Wrought Iron for Piping Systems." Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

THE RUHR—
VALLEY OF DECISION

FOR AMERICANS and for American business the most important single spot on earth today is the Ruhr Valley of Germany—a valley no bigger in area than the State of Rhode Island. Upon recovery in the Ruhr hinges recovery in Europe. Upon recovery in Europe hinges the peace of the world.

No machine can run with its most important part missing. Western Europe without the Ruhr is a dead machine. Before the war, over half the coal and steel produced in the Western part of Continental Europe came from this one little valley. Today, the fact is that no other region in Europe has the technical skills and enterprise to produce the industrial supplies which Europe must have if it is to help itself back to a self-supporting economy. And, after observing Europe for many weeks, I am convinced that no one but the United States can successfully supervise the rebuilding of the Ruhr.

If you will keep four considerations in mind, as the international politicians gamble, you can easily tell whether the United States is playing its proper role in the rehabilitation of the Ruhr. Here are the four considerations:

I. We are paying for the Ruhr rehabilitation (or the lack of it).

II. We alone have the skill and enterprise to supervise its rebuilding.

III. It will be a tough organizing job requiring money, hard work, and outright sacrifice on the part of management men and technicians.

IV. We had better do it well if we love our children.

I

We are paying for rebuilding the Ruhr—or we soon shall be. The British now control the Ruhr, its government and its industry. They have been paying out about four hundred million dollars—American dollars—a year to buy the food, raw materials and equipment needed to rebuild the Ruhr. The British must spend American dollars for these supplies because the supplies can not be bought anywhere but in America. Thus far the British have, in effect, obtained the dollars which they spend for the Ruhr by drawing them out of the $3,750,000,000 loan which we granted Britain last year.

Now the loan is fast running out. The British lack dollars and other assets. We must take over, directly or indirectly, the dollar expenditures for rebuilding the Ruhr. We shall pay for it. Therefore—

II

We should supervise it. The British have been running the Ruhr's industry. They might conceivably suggest to Washington that they continue to run it while we pay the bill. *That we should never agree to.* There is a sound old rule that he who pays the piper shall call the tune.

Perhaps we would not need to invoke that rule if the British had done a good job reviving the industries of the Ruhr. *They have done a poor job—physically and ideologically.*

The physical output of the coal mines and steel mills of the Ruhr in recent months was actually smaller than at the first of the year. Production of coal amounts to little more than half of the pre-war 127 million tons per year. Steel productions limps along at one-sixth of the pre-war rate—far below the volume permitted even under the present low level-of-industry plan for Germany.

Ideologically, the British Labor Government has tried to export to Germany the brand of socialism which is making such a dubious record at home. Foreign Minister Bevin—although he may now have misgivings about it—committed himself to nationalization of the Ruhr's coal and steel industries. British representatives have pushed hard to get General Lucius Clay, our able military governor in Berlin, to agree to socialization of the Ruhr. So far, he has resisted this pressure, but our State and War Departments and we as individuals must back him up to the limit if he is to continue to combat this pressure successfully.

Even if the British government were not socialist, there would be good reason for questioning the ability of Britain to rehabilitate the industries of the Ruhr. In recent generations, the British management class has shown itself more

interested in cartels, restricting output, and allocating markets, than in full-steam, ingenious enterprising production.

Certainly the British must remain full partners in the *political* administration of Germany. No one suggests anything else. However, their recent production record demands turning the job of revitalizing the Ruhr industries over to the nation which is paying the bill and which leads the world in production.

If we have any faith in the business philosophy by which we have lived and prospered for 170 years, we should demonstrate that that philosophy still is dynamic by taking up the burden of the Ruhr.

III

It will be a tough job. It will require men and supplies and money from the United States. It can not possibly be done in less than five years. A list of some of the necessary steps shows how hard it will be.

A. Plans for socializing the Ruhr should be shelved quickly. The industries there should remain in trusteeship for five years. Then the Germans themselves should decide their ownership; let us hope that by that time we can demonstrate to them that private ownership and private initiative mean high production, good distribution and high wages.

B. The top supervising management jobs—both the top policy and the top technical jobs—required outstanding business ability. That is why American business men must be willing to go to Germany, sacrificing comfort and leisure, and even income, if necessary.

C. Germans should take over the management job at the operating level. The Germans are good technicians. They have a greater incentive than anyone else for getting the Ruhr back in working order. That incentive should be harnessed.

D. Special effort should earn special rewards. There is nothing wrong with the Ruhr (or the rest of Europe) that hard work will not cure. Before a man will work hard, he must feel that his work will advance him and his family. That simple motive, which powers our whole economy, must be revived in the Ruhr. To revive it requires enormous ingenuity and work... a new currency... a logical customs union... a sensible ration system... enough food, clothing, housing and consumer goods so that the worker can buy something with his currency and his ration points.

E. America will have to furnish a good share of these foodstuffs and supplies. Certain key items of equipment also will be needed. Only as we succeed in our job can this flow be diminished.

F. A sensible priorities system must channel Ruhr coal and steel into those uses which, in turn, will further increase output. Repair parts for railroad cars should stand high on the list. Housing, coal equipment and machine tool parts should come ahead of the automobiles and permanent steel bridges which at times have been accorded preference.

German technical management of industry in the Ruhr—point C above—need not mean *political* control of the Ruhr by some future sovereign German state. As the French know, the Ruhr, next to the atomic bomb, is the most dangerous weapon in the world. It is the arsenal without which no European power, even Russia, would dare start a war. There is no sense in turning that arsenal back to the *political* control of a nation which twice in 25 years used it for aggression. (And three times since 1870.) Surely we have enough resourcefulness to let the Germans who live in the Ruhr run the industries there without turning political control over to a central Prussian state.

This partial list shows how much hard work and statesmanship the United States must put into the Ruhr. But—

IV

We had better do it if we love our children. If we do not do this job—if we should pull out of Germany or fail there—we leave behind us a vacuum which neither Britain or France has the strength or ability to fill. Russia has the will and, if left unopposed, the power to fill that vacuum. Therefore, the day we fail or the day we pull out of Germany, the third world war takes a long step closer to us and certainly to our children. What greater incentive does any American need to work for than our success in this field?

If we succeed, the western zones of Germany in conjunction with Belgium and Holland can become self-supporting in three to five years. That way lies recovery for all Europe. That way lies peace for the world. That way lies vindication for the American business system in which we believe—the system of competitive private enterprise, with freedom for the individual and his initiative.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THIS IS THE 60TH OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

IN BRITAIN AND FRANCE THE NEED IS MORE OUTPUT PER MAN-HOUR

The need for greater output per man-hour of work is apparent outside as well as inside the United States. As this is written, I am nearing the end of a two-month visit to European countries, during which I have spent much of my time within the factories of England and France.

In Britain, at this moment, there are being predicted: Shutdown of non-essential industries; longer work week; virtual government control of jobs in industry.

In France, employers and workers have agreed, subject to government approval, to raise wages while maintaining control of prices, in order to bolster standard of living.

Obviously Britain has reached the point where her living standards must be reduced so that she can export more. However, there is a minimum below which they must not be reduced if her people are to go on working effectively. She lacks workers, and she lacks materials. Some workers can be taken from the armed forces and from the less essential occupations. Materials cannot be had, other than by loan or gift, except by trading exports for them. And of course the time must come when the people of Britain will live much better than they do now. Their built-up needs and wants are tremendous.

Greater output per man-hour will help England not only to increase her production for export, but also will put her in a better competitive position, and will tend to give her more goods and services for domestic consumption.

France, too—and of necessity—has followed a policy of manufacturing for export. However, she has not been as successful as Britain, because of the high prices at which she has had to sell her products to cover costs. Devaluation of the franc, which is likely to come, will help some. In the meantime, a greater share of her manufactures is being consumed at home than is the case in Britain. Like Britain, however, she is short of materials, fuel, and workers.

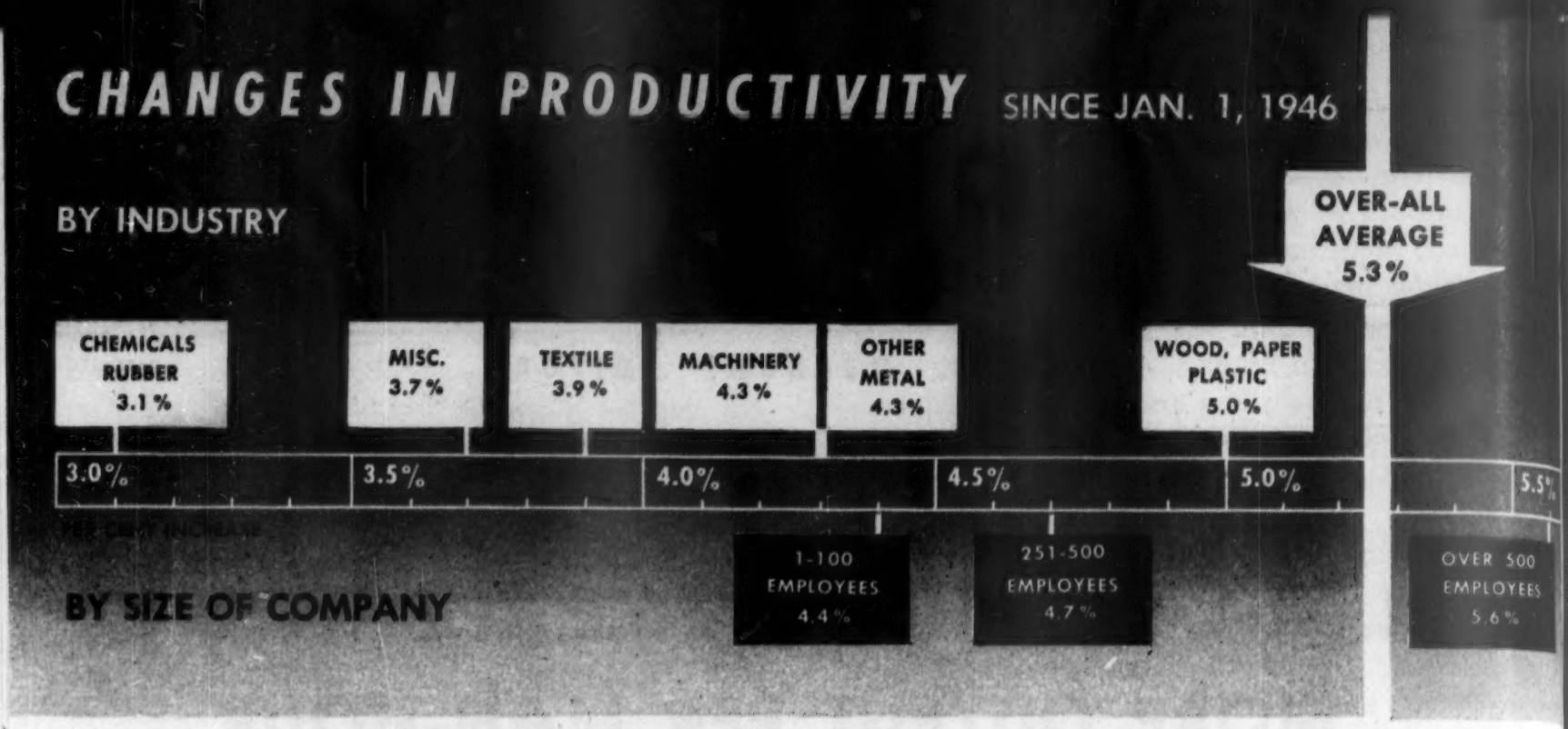
When goods from France begin to move into the export markets in quantities commensurate with the welfare of the French economy, the French people will no longer be able to consume as much as they do now, unless total production is increased. No further argument is needed in support of increased efficiency in the manufacture of the products that this nation is to trade and consume. She has much to gain by achieving low production costs, upon which to base low selling prices that will lead toward wide distribution.

There is no intent here to condemn British and French industry out-of-hand as inefficient. It is rather my purpose to state the fact, as I have done countless times in regard to American industry, that greater efficiency is needed in manufacture in the interest of higher standard of living.

It is my conviction that a considerable portion of the management personnel of both Britain and France recognize this, and are working toward bringing it about. They are handicapped in many instances by lack of modern equipment; by shortages of materials; and by working forces that never have had demonstrated to them the far-reaching possibilities of the philosophy and practice by which industry essays to reduce unit costs even by almost infinitesimal amounts.

Regardless of whys and wherefores, it is inescapable that a vital factor in the formula for higher standard of living is low-cost production.

L. C. Morrow



WHAT'S HAPPENING

Productivity is up again. During the past year and a half it rose 5.3 per cent, or at a rate that is slightly better than the long-time (1899-1939) average of 3 per cent a year.

This is the first of three important facts disclosed by a nation-wide FACTORY survey of 476 companies with 1,070,420 employees.

Second, the factors mainly responsible for this healthy reversal of the downward wartime trend are better equipment, incentive pay plans, and improved factory methods.

Third, wage increases during the same year and a half far outstripped the modest gains in productivity. *This is a danger sign* because the only true source of higher wages is greater output (FACTORY, February, 1946, page 82).

FACTORY also asked this question: *Do you believe that the level of productivity in your company is such that a further increase in productivity will justify a corresponding increase in wages?*

An even third of all respondents said *yes*. But the real significance of the answers lies in the fact that almost 90 per cent of those that said *yes* were companies that had registered gains in productivity. The others apparently recognize that it would be courting disaster through inflation to boost wages further until increases in productivity at least partially close the present gap.

In the period covered by the survey—January 1, 1946, to August 6, 1947—hourly wage rates in the 476 companies increased by an average of 23.5 per cent, compared with an average net increase in productivity of 5.3 per cent. When combined with the fact that productivity showed a slight downward trend during the four war years, the disparity becomes even more striking. *Since 1939, productivity has risen by a little more than 11 per cent; hourly wages have skyrocketed to the tune of 95.5 per cent.*

However, the picture isn't as clear-cut as these over-all averages would seem to indicate. One-sixth of all companies have experienced a continued decline in productivity—and the decline has been sharp, an average of 12.9 per cent.

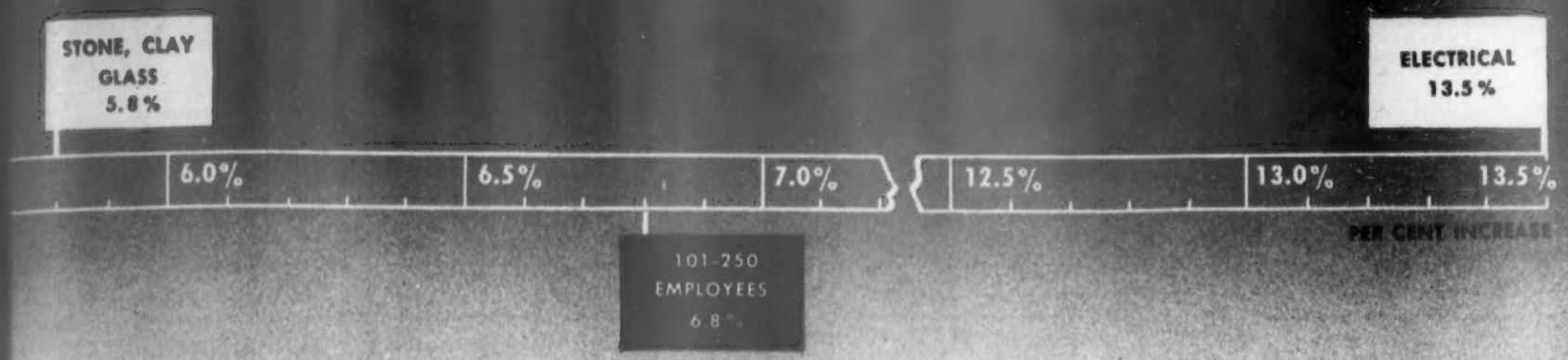
While another 30 per cent of the companies reported "no change," the balance—more than half—showed an average increase of 14.2 per cent. A small but significant number of companies recorded gains of 50 per cent and more.

Careful analysis of the *names* of the companies reporting increases gives no indication that gains were limited to previously "backward" companies. Companies long ago reputed to be doing the "best job in their industry" were almost invariably on the "plus" side. *Here is evidence,* if more is needed, *that a combination of good management, good equipment, and good labor relations can continue to increase output per man-hour.*

Unhappily, there is little correlation between increase or decrease in productivity and the amount of increase in wages. About 70 per cent of companies fell within the 18 to 30 per cent "pattern" of increases. Broken down, about half of these reported productivity gains—the same proportion as in the over-all picture. But it is highly significant that, of those in this group reporting gains, many attribute the gains to some sort of incentive pay plan, bonus, or profit-sharing system.

Where the pay rise has been less than 18 per cent—predominantly companies with fewer than 100 employees—the percentage of replies indicating gains in productivity was considerably lower than average. It is difficult, however, to separate cause and effect in

As reported Aug. 6, 1947, by **447** companies with more than a million employees



TO PRODUCTIVITY

Q What factors have caused productivity to change since January 1, 1946?

A

Causes of increase	No. times mentioned
Better equipment and facilities	73
Incentives or bonus	50
Improved factory methods	54
Better-skilled labor force	54
Improved employee relations	44
Good management	42
Seven other	44

Causes of decrease	No. times mentioned
Post-war "letdown"	28
Labor, union troubles	23
High labor turnover	15
Eight other	33

ANALYSIS: Better equipment and its first cousin, better methods, have been big factors. And the worker himself is producing more. This is attested to by such items as worker skill, incentive pay plans, and employee relations. The high position of incentives on the list suggests that workers will turn out more per man-hour when convinced they will be fairly rewarded. Significantly, many responses mentioned "profit sharing" specifically.

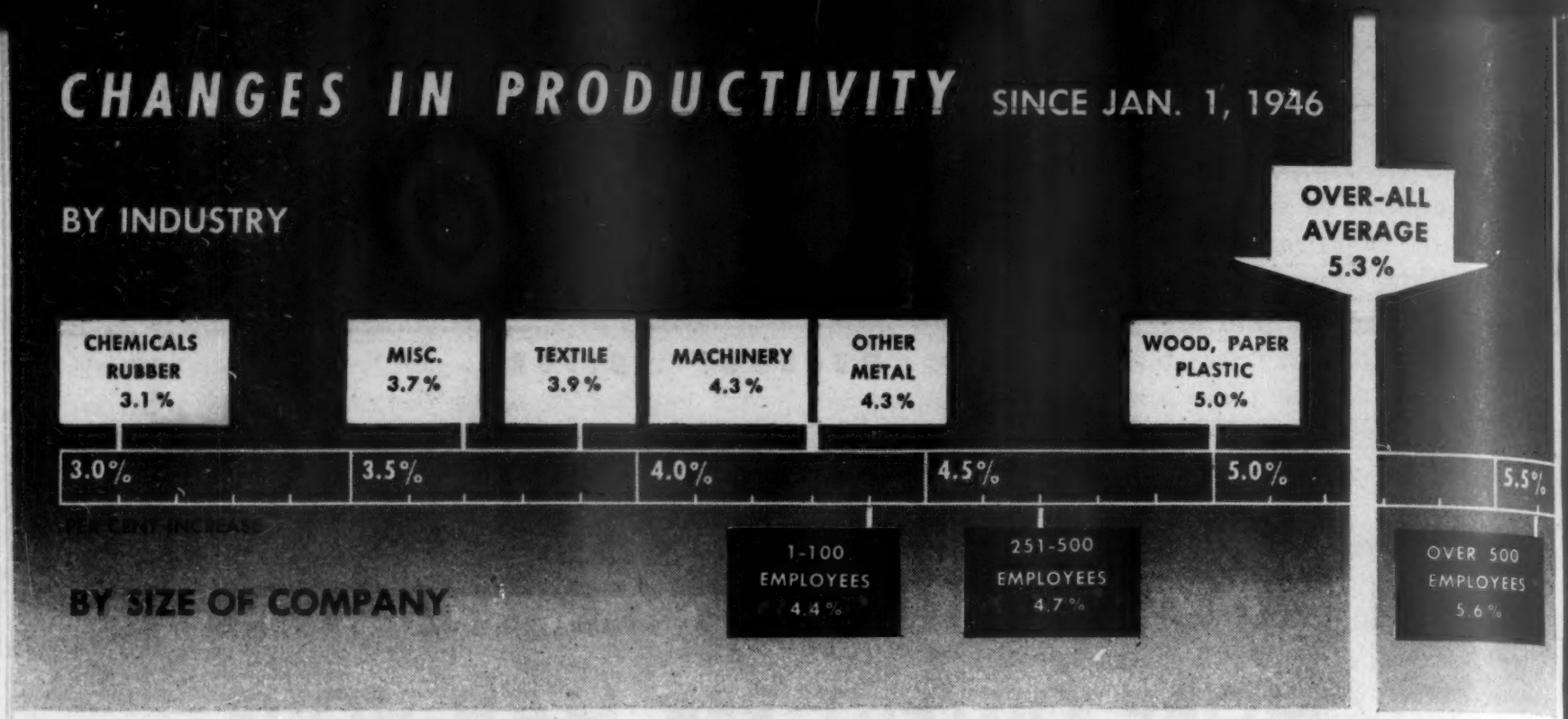
On the debit side, the fact that the most frequently mentioned reason for decreases, "post-war letdown," is a necessarily temporary condition is encouraging. Need for improvement in labor-management relations in many plants is emphasized by both second and third items.

Q What will help most to increase productivity in the year ahead?

A

Factor	No. times mentioned
Better equipment and facilities	84
Worker attitude and efficiency	72
Improved factory methods	57
Better management and supervision	52
Incentives or bonus	50
Depression, scarcity of jobs	50
Availability of materials	26
Reduced union influence	19
Five other	41

ANALYSIS: Two factors, each beyond the control of either management or workers, enter the picture here. Comments regarding "availability of material" were generally optimistic, but the discouragement of a small but alarming percentage of companies is reflected in the answers that "only a good depression" or "jobs becoming scarce" will cause productivity to rise. There is no definite pattern to such answers by either industry or company size.



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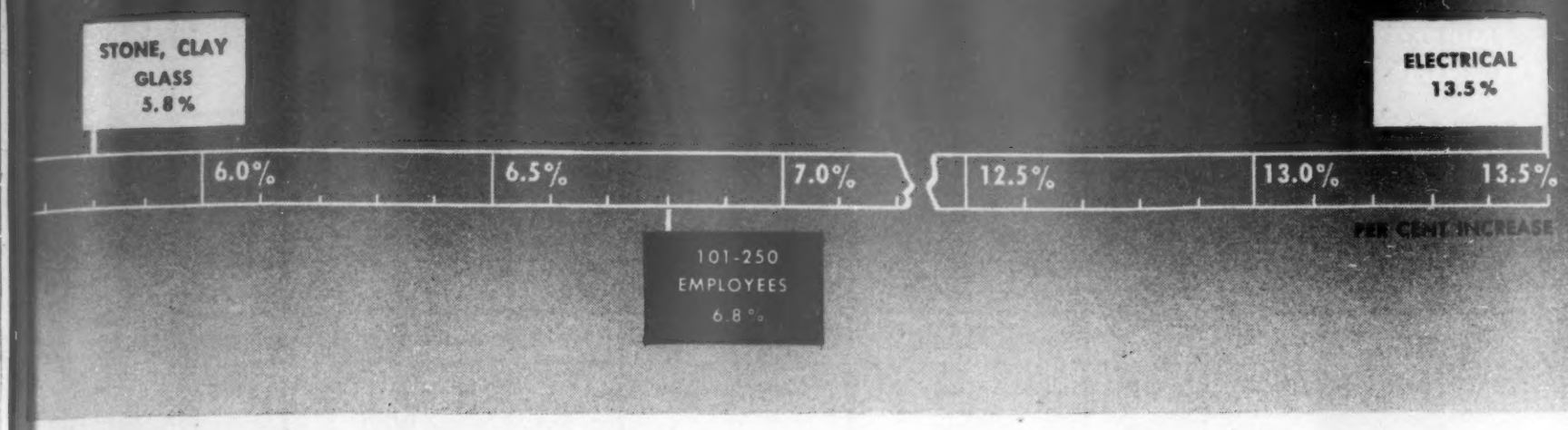

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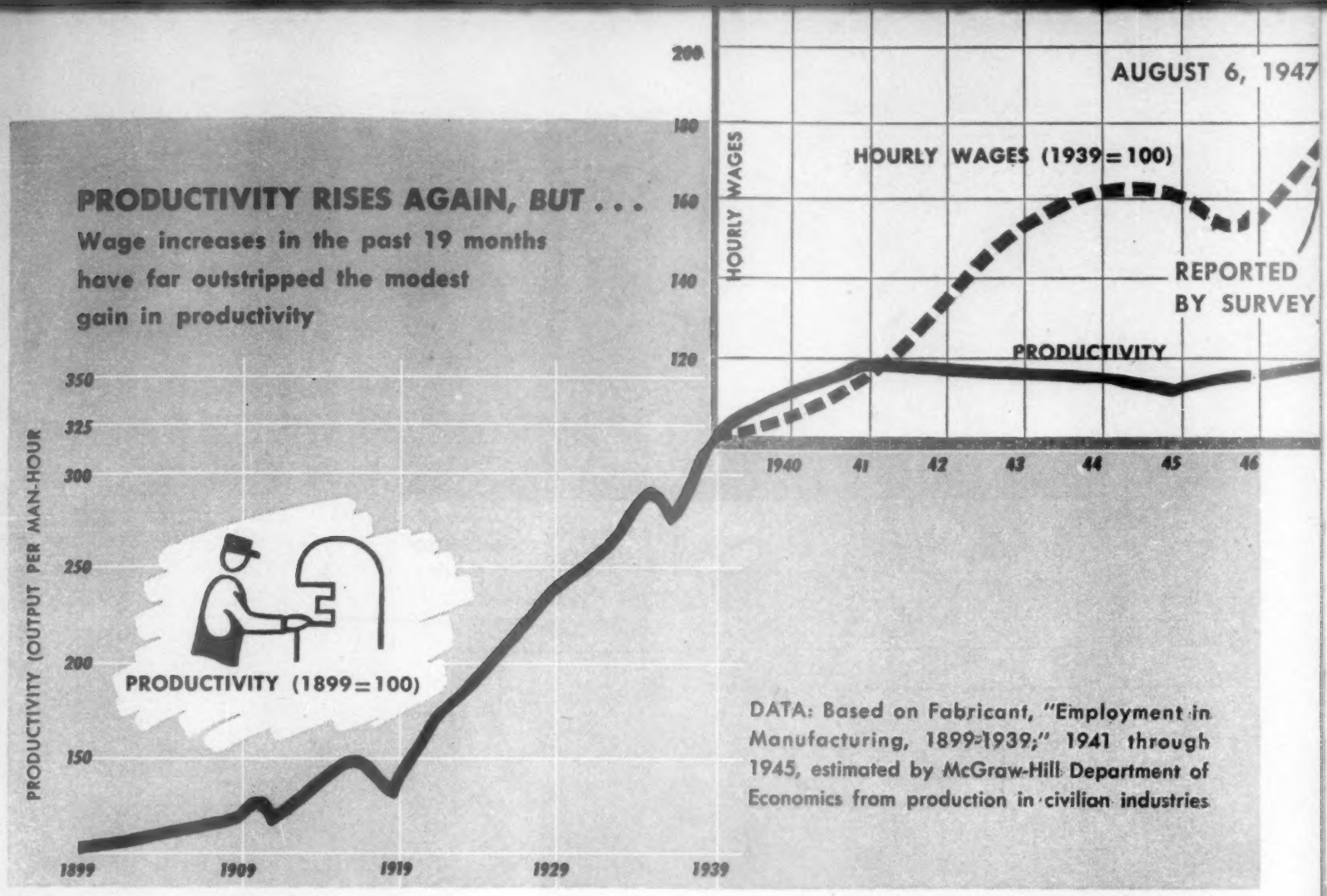
Q. HOW MUCH HAS PRODUCTIVITY CHANGED IN YOUR COMPANY SINCE JAN. 1, 1946?

Figures in brown represent totals in each category; NC designates a reply of "no change." Only 447 replies are tabulated since 29 companies failed to answer this question or said "don't know."

SIZE OF COMPANY	1-100 EMPLOYEES		101-250		251-500		OVER 500		ALL COMPANIES	
INDUSTRY, No. EMPLOYEES REPRESENTED	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE
	9	+12.5	12	+14.5	6	+13.3	13	+14.5	40	+13.9
MACHINERY	7	NC	1	NC	6	NC	3	NC	17	NC
103,843	8	−19.0	2	−13.0	1	−8.0	6	−10.0	17	−14.5
	24	−1.7	15	+10.0	13	+5.5	22	+5.8	74	+4.3
	15	+31.5	2	+52.5	6	+11.7	12	+11.2	35	+22.4
ELECTRICAL	6	NC	—	—	—	—	8	NC	14	NC
258,628	3	−13.3	2	−7.5	—	—	—	—	5	−11.0
	24	+18.0	4	+22.5	6	+11.7	20	+6.6	54	+13.5
	9	+14.0	9	+14.0	22	+13.1	34	+10.8	74	+12.4
OTHER METAL	13	NC	11	NC	9	NC	16	NC	49	NC
272,687	6	−13.0	3	−18.0	6	−13.7	6	−15.0	21	−14.5
	28	+1.6	23	+3.1	37	+5.6	56	+5.0	144	+4.3
	2	+10.0	5	+9.0	1	+10.0	9	+13.3	17	+11.5
CHEMICAL, RUBBER	3	NC	3	NC	1	NC	5	NC	12	NC
66,032	5	−13.0	—	—	2	−10.0	—	—	7	−12.1
	10	−4.5	8	+5.6	4	−2.5	14	+8.6	36	+3.1
	2	+10.0	1	+5.0	3	+22.3	5	+15.6	11	+15.4
STONE, CLAY, GLASS	2	NC	2	NC	1	NC	—	—	5	NC
56,473	1	−10.0	—	—	2	−17.5	1	−10.3	4	−13.7
	5	+2.0	3	+1.7	6	+5.3	6	+11.3	20	+5.8
	2	+5.0	—	—	2	+11.5	8	+9.1	12	+8.5
TEXTILE	—	—	2	NC	3	NC	3	NC	8	NC
50,683	—	—	—	—	2	−10.0	—	—	2	−10.0
	2	+5.0	2	NC	7	+0.5	11	+6.6	22	+3.9
	4	+14.0	8	+7.0	6	+12.2	9	+14.0	27	+11.2
WOOD, PAPER, PLASTICS	1	NC	3	NC	3	NC	5	NC	12	NC
52,150	2	−10.0	1	−10.0	1	−21.0	3	−7.7	7	−10.5
	7	+5.1	12	+3.8	10	+5.2	17	+6.0	46	+5.0
	6	+12.0	3	+50.0	—	—	13	+9.3	22	+15.6
MISCELLANEOUS MANUFACTURING	4	NC	2	NC	1	NC	8	NC	15	NC
209,924	4	−6.7	4	−11.2	3	−7.0	3	−21.0	14	−11.2
	14	+3.2	9	+11.8	4	−5.2	24	+2.4	51	+3.7
	49	+18.5	40	+16.5	46	+13.3	103	+11.5	238	+14.2
ALL INDUSTRIES	36	NC	24	NC	24	NC	48	NC	132	NC
1,070,420	29	−13.9	12	−12.2	17	−12.2	19	−12.9	77	−12.9
	114	+4.4	76	+6.8	87	+4.7	170	+5.6	447	+5.3



this situation, or to establish with certainty that there is a definite relationship.

But that there does appear to be some correlation between recent wage boosts and productivity rises is seen from an analysis of 22 companies reporting wages up 40 per cent or more in the survey period. Only 3 recorded drops in productivity (average, 8.7 per cent), while 5 experienced "no change." The remaining 14 showed an average increase of 15.7 per cent. Thus the net for the group was plus 8.8 per cent. These figures are significantly in advance of the general averages shown in the chart. But they are not more than double the over-all figures—*and the corresponding wage increases were.*

To determine whether there was any correlation between the granting of "indirect" benefits and the changes in productivity, FACTORY asked how these benefits had changed in the survey period. Twenty-two per cent of all companies reported a *large increase,* 44 per cent a *small increase,* and 34 per cent *no change.* And the group of companies that granted a *large increase* had the poorest record for productivity gain, 4.3 per cent. Those reporting *no change* had the best record, 6.1 per cent.

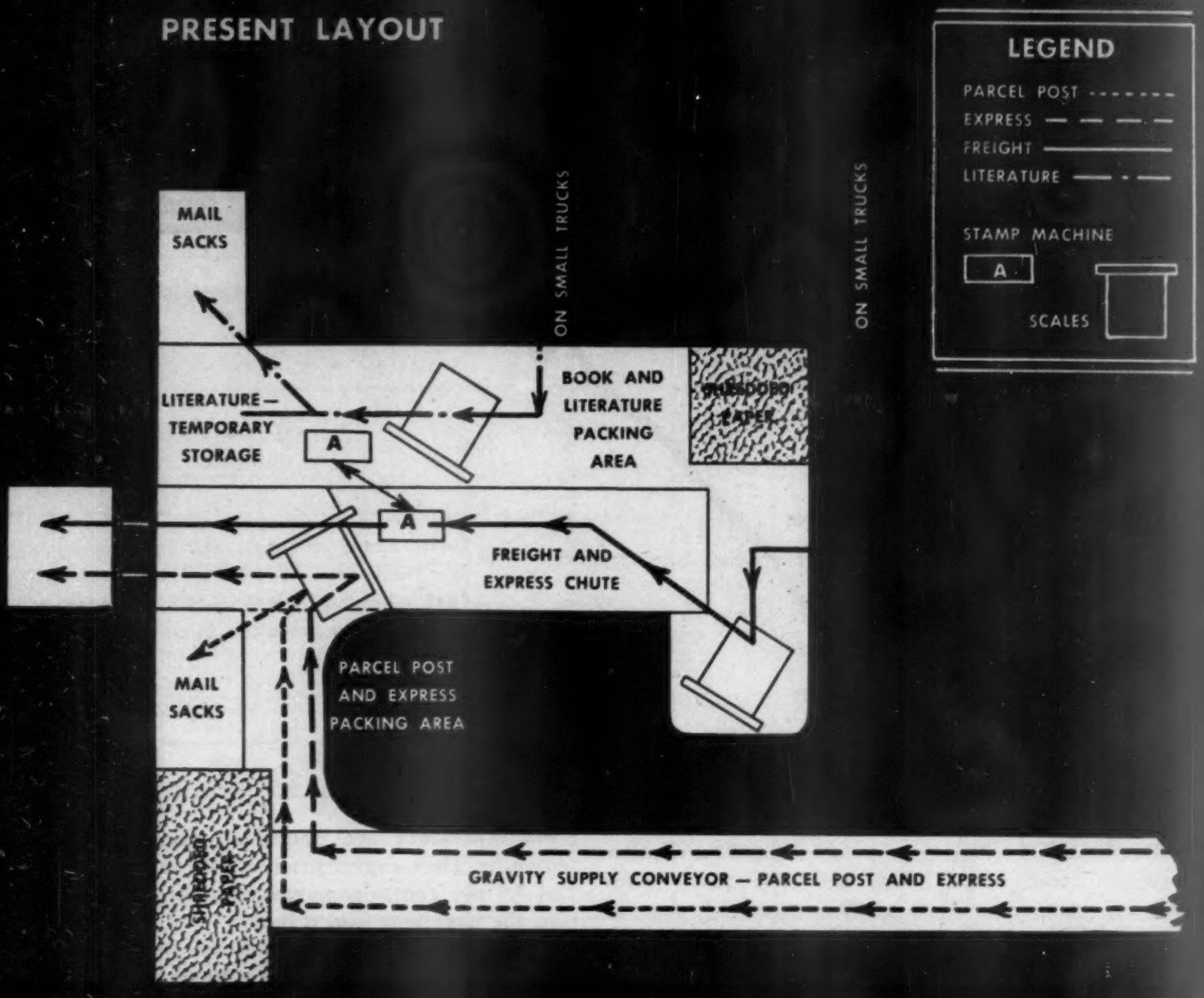
In spite of the spottiness of the present picture, management is optimistic about productivity in the future. The per-year rate of increase since January 1, 1946, has been 3.3 per cent—a figure industry confidently expects it can more than double in the 12 months ahead.

And there is nothing "spotty" about *that* expectation. Only 2 per cent of respondents expect productivity to decline; 6 per cent more expect no change. *Ninety-two per cent predict that productivity will rise an average of 7.6 per cent in the next year.*

Manufacturers are optimistic about the next 12 months. They expect productivity to rise an average of 7.6 per cent, compared with the 5 per cent gain in the past year and a half.

Bulk of the companies believe wage rises have so far outstripped productivity gains that further increases in output per man-hour would not justify wage hikes at this time. Electrical industry and small plants split almost 50-50 on this, however, and two-thirds of small plants in electrical industry say that wage increases *would* be justified.

INDUSTRY	WAGE RISE SINCE 1-1-46 (% rise)	EXPECTED RISE IN PRODUCTIVITY IN NEXT YEAR (% increase)	WILL RISE IN PRODUCTIVITY JUSTIFY WAGE INCREASE? (% saying "yes")
MACHINERY	23.4	6.9	37
ELECTRICAL	17.6	9.6	47
OTHER METAL	24.1	7.6	30
CHEMICAL, RUBBER	20.8	7.7	30
STONE, GLASS	17.7	9.0	13
TEXTILE	28.5	1.6	23
WOOD, PLASTIC	27.2	7.5	32
MISCELLANEOUS	25.4	7.8	30
PLANT SIZE			
1-100	15.9	7.8	47
101-250	24.2	9.1	33
251-500	25.5	7.3	32
OVER 500	25.7	6.6	21
ALL RESPONDENTS	23.5	7.6	33



REVAMPED SHIPPING LAYOUT CUTS COSTS 10 TO 30 PER CENT

C. M. ERICKSON • ASSISTANT PLANT SUPERINTENDENT, THE LINCOLN ELECTRIC COMPANY, CLEVELAND

Five people instead of six now handle 40 per cent greater volume in the parts shipping section at Lincoln Electric. The savings thus effected have been achieved almost exclusively by a simple rearrangement of existing facilities.

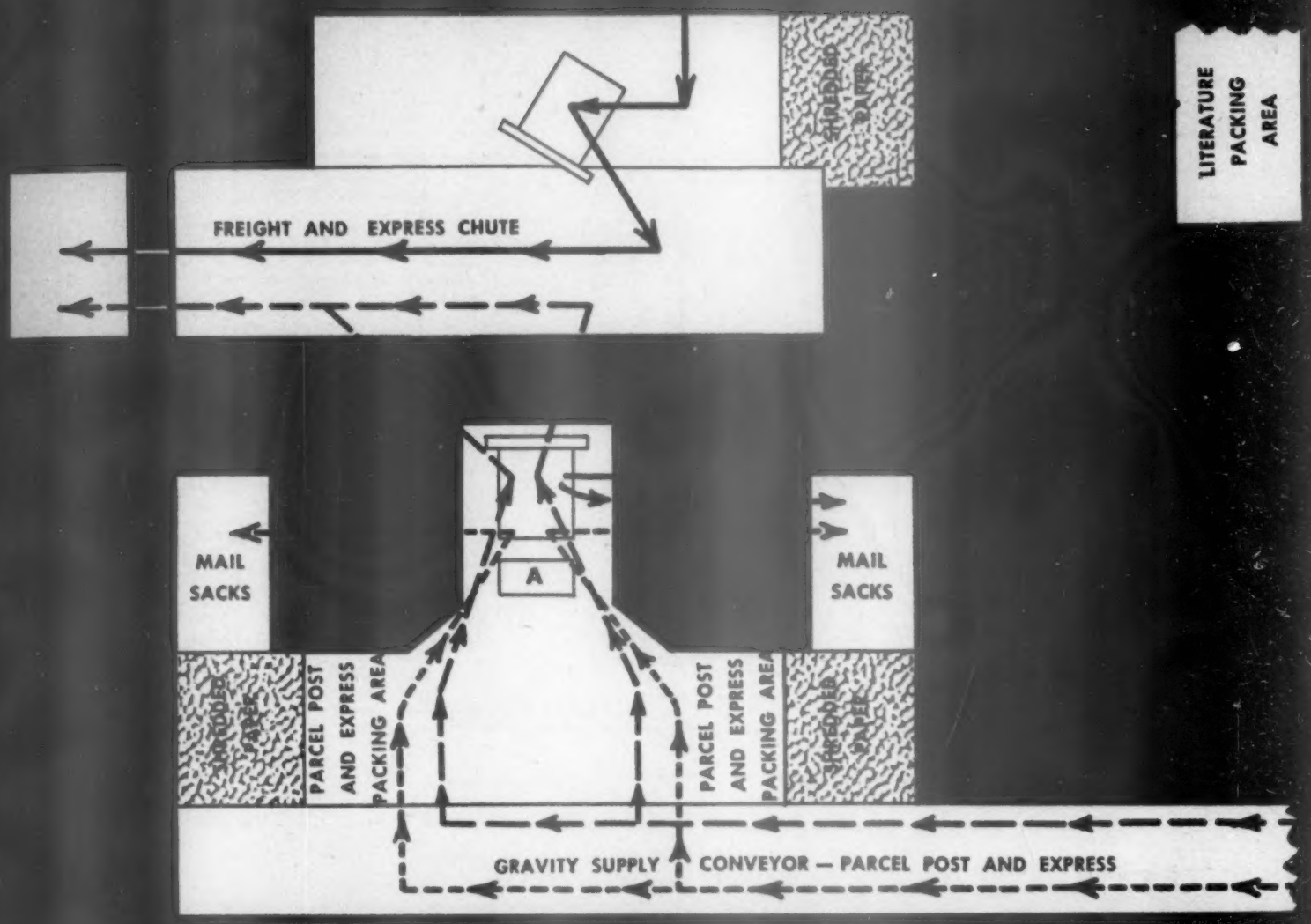
"Flow of material" studies demonstrated what could be done with a small amount of moving. A third scale was the only additional equipment, beyond a few homemade fixtures and work tables, needed for a further simplification to the present efficient layout.

The principal savings have resulted from the shortening of flow lines by means of rearrangement of workplaces in the shipping area. The distances from the point at which the conveyor brings material into the shipping room from the small parts stockroom to the point of actual shipping have been reduced as follows:

Parcel Post. Reduced by 26.5 per cent, from 11.3 to 8.3 feet.

Express. Reduced by 35 per cent, from 10 to 6.5 feet.

FORMER LAYOUT



Freight. Reduced by 7.1 per cent, from 7 to 6.5 feet.

Literature. Reduced by 42.5 per cent, from 19.7 to 11.3 feet.

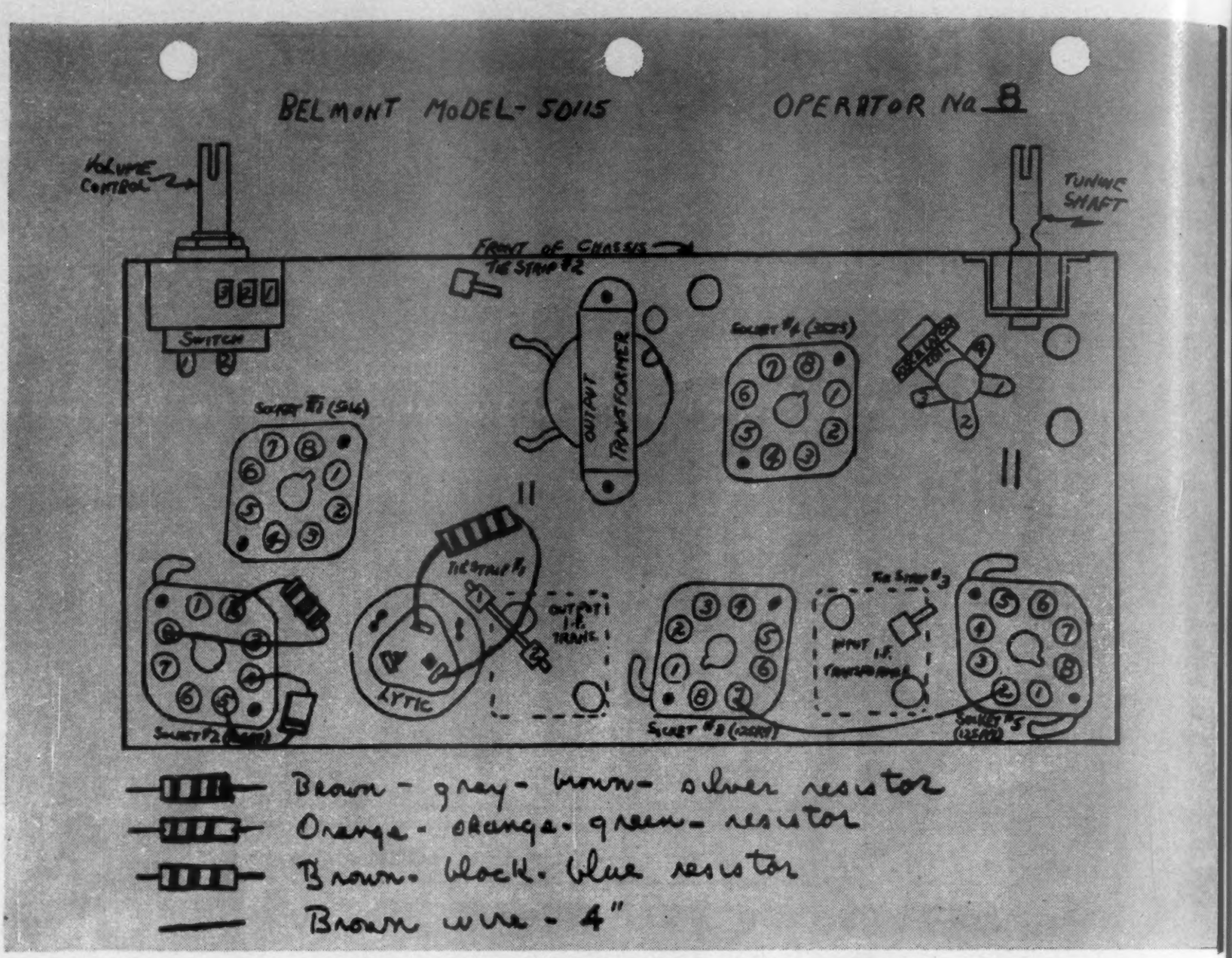
In addition to the reduction in feet of travel through the section, other desirable features of the new layout include (1) straightening out the flow of material into the area; (2) elimination of lines of flow crossing one another; (3) and workplaces arranged in accordance with the best time and motion technique.

Actual dollar savings in the cost of operation of the section have closely paralleled the amount of shortening of the flow lines. Despite an average increase of about 40 per cent in shipments handled by the reduced personnel, the following cost reductions have been effected: Parcel post, 30 per cent; express, 30 per cent; freight, 10 per cent; and literature, 30 per cent. In addition, 25 per cent of the space required for shipping purposes has been freed.

Reference to the former layout will show that the scale in the center was the scene of considerable confusing activity. A third scale for the book packing area has eliminated much of this confusion.

The stamp machine shown next to the scale in the former layout must be used by both the parcel post and literature packing sections. Since the purchase of an additional machine of this type would involve a considerable expense, the old machine has been mounted on a post between the two positions, and may be swung either way.

Convenient location of shipping container sections in overhead racks, and shredded paper—used to protect the parts in packing—in a bin beside the packing station, enables the worker to perform the packaging operation on a relatively clear workplace. A chute is provided in the rear of the freight and alongside the express stations, which carries the boxes directly to the shipping floor. In the rear of the parcel post station and at the right of the literature packing station are mail bags held in a rack. The operators need only push the packed material off the desks into the bags.



FOUR PARTS to be installed by operator No. 8 on Belmont Model 5D115 appear in corresponding color and position on chart. Legend below diagram lists proper colors painted on each part to avoid operator error in part selection

JOB INSTRUCTION SHEETS INCREASE OUTPUT PER MAN-HOUR

W. L. HARDESTY • MANAGER, BELMONT RADIO CORPORATION MASON CITY, IOWA

Time and money are saved through use of job instruction sheets at Belmont Radio (a subsidiary of Raytheon Manufacturing Company). This is how it is done.

Job instructions are listed in sequence on a plant operation layout form. On the same form are listed, by part number and description, the materials needed for the job. On the reverse side appears a sketch of the chassis of the model on the assembly line. Parts are drawn in colored pencil on the chart, in the position they are to occupy in the model when they are installed.

The operator at the work station reads the job instruction sheet and chart and attaches them, with chart exposed, to the wall before her. Reference can be made to the chart or instruction sheet when necessary.

Parts are placed in trays before the operator. As the jig rolls up, with chassis attached, the operator is prepared to complete the task without delay. Coloring on chart corresponds with colors of the actual parts. Instructions are specific and formal. There is little opportunity for differences of opinion to develop. New operators can be trained rapidly at greatly reduced cost. Reorder of parts is simplified since operator has all the information needed.

BELMONT RADIO CORP.

OPERATION LAYOUT

DATE 4-2-47

MODEL 52115 OPERATION NAME 6th Wirer OPERATION POSITION NO. 8 of _____ OPER'S.

ENG. CHANGES

ITEM	INSTRUCTIONS	C. O. ITEM	PRT. NO.	DESCRIPTION OF MAT'L.	QUANTITY
1.	Connect one end of brown & gray & brown & silver resistor to lytic square lug other end to unmarked lug on lytic as per drawing.		A9B2-53	Resistor 180 ohm 1W ± 10 %. 1/8 x 1/8 cut.	
			4"	Brown wire #22 - 5/16 x 5/16	
2	Connect short end of brown & black & blue resistor to socket #2 lug #2 other end thru lug #3 to lug #8 on socket #2 as per drawing.		A9-B1-37	Resistor 10 meg ohm 1/2 W ± 20% 3/4 x no cut.	
			A9B1-34	Resistor 3.3 meg 1/2 W ± 20 % 3/4 x 3/4 cut.	
3.	Connect one end of orange & orange & green resistor to socket #2 lug #4 other end to lug #5 on same socket as per drawing.				
4.	Place 4" Brown wire from socket #3 lug #7 to socket #5 lug #2 as per drawing.	SUB-ASSEM.			
		WIRE CONN.			
		SOLDER CONN.			
		PICKUPS			
		LAY ASIDE			
		OBSTRUCTION			
		PRE-BEND	TOOLS		
		DRESS			
		TWIST			
		THREAD			
		BUTT SOLDER			
		SPOT SOLDER			
		TAPE			

(See other side for sketch—layout)

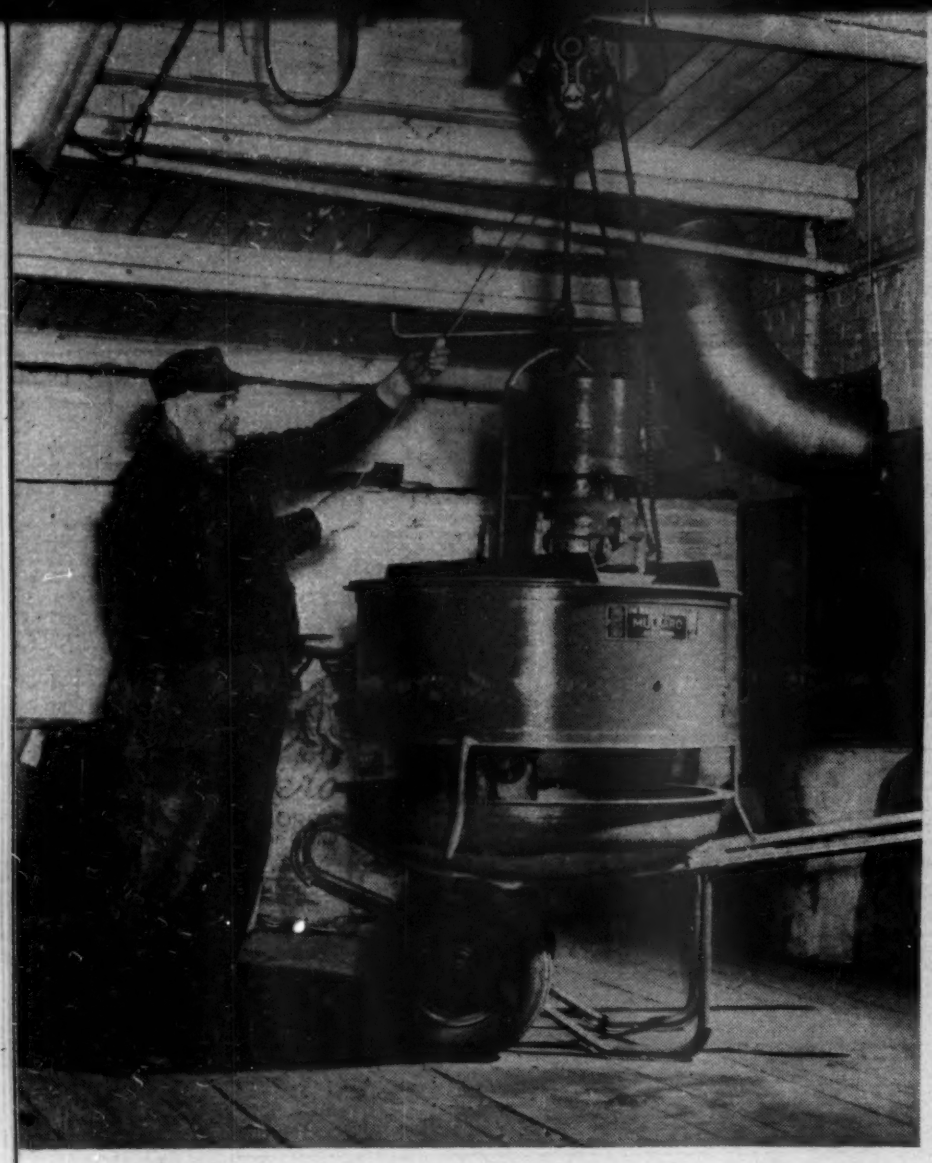
FORM No. GF-74 5000 3-46 W.

SPECIFIC INSTRUCTIONS, parts numbers, and description of the parts to be installed are listed on the job instruction sheet, which is the reverse side of the chart shown on the facing page Note the simplicity of the instructions

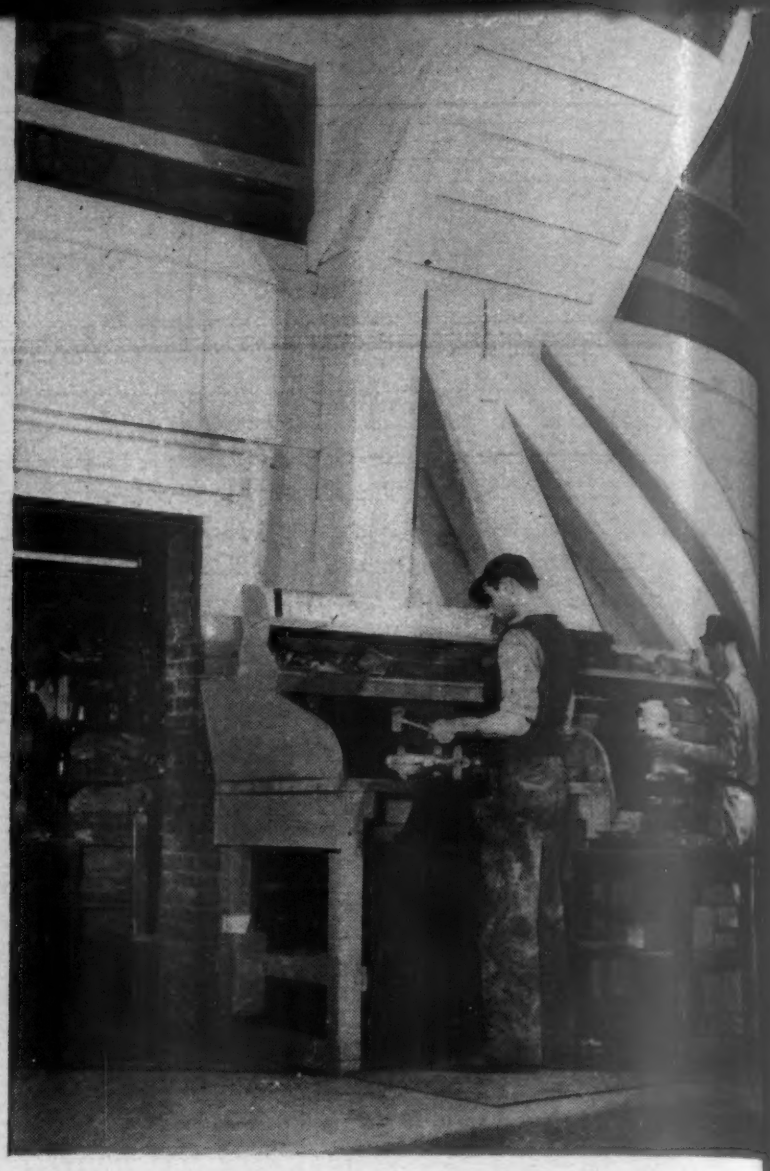
ADVANTAGES

1. Instruction sheets are easy to understand, help train new operators quickly
2. Changes in models can be effected with little difficulty
3. It is simple to increase or reduce number of operators on the assembly line
4. Changes in engineering and materials are kept up to date
5. Stock re-ordering is simplified
6. Cost breakdown for inventory is made easier
7. Operators can move from one work station to another with little difficulty and no additional training

OPERATOR, with parts, chassis, and corresponding chart before her, is easily trained for her job



CORE SAND is trucked in from the street and dumped in a room on the second floor level, where it is prepared by mulling in the unit shown



AFTER MULLING, the core sand has to be wheeled only 10 feet to the chute that takes it to the coremakers' benches

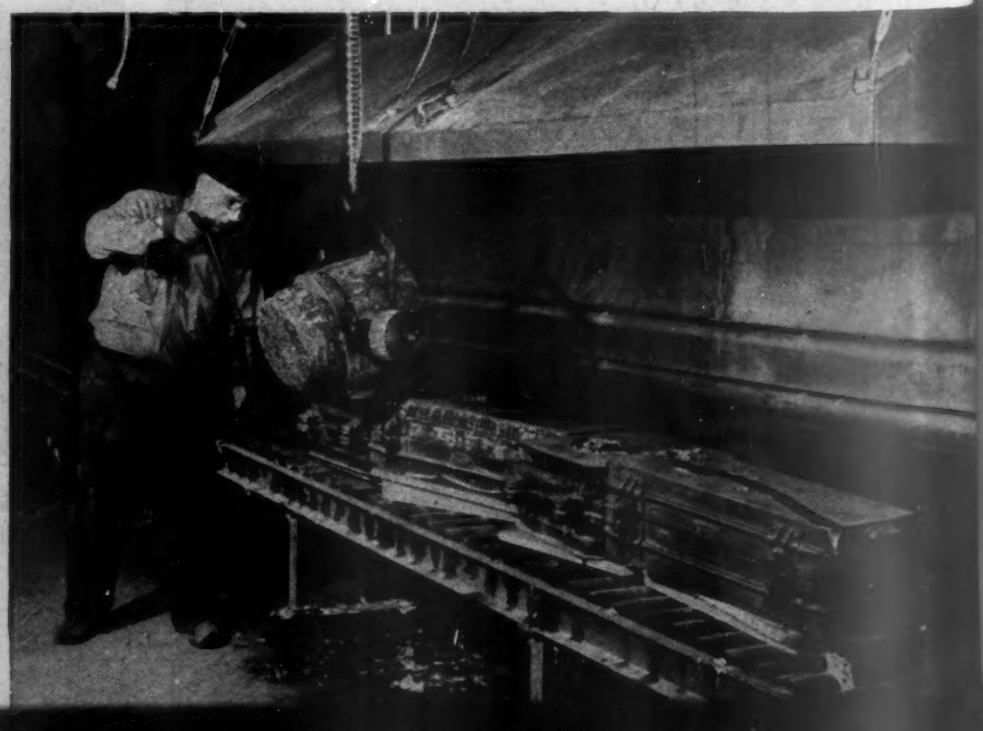
MODERNIZED FOUNDRY TO MAKE IT A BETTER PLACE TO WORK

Purpose of a recent modernization program at United States Rubber Company's Shoe Hardware Division at Waterbury, Conn.. was to make work in the foundry easier, more pleasant, more healthful. This particular foundry produces aluminum alloy lasts—these are the forms on which waterproof footwear is built.

There was urgent need to increase production, but how to do it was a serious problem because additional

METAL IS MELTED in 400-lb. capacity gas-fired furnaces. Molten metal is handled in 100-lb. capacity ladles by an electric hoist running on a monorail track

SMOKE AND FUMES at the pouring station are removed by a hood through which the air velocity is 150 feet per minute. This hood has a 3-in. wide take-off at the edges, a back take-off with 2-in. slots, and another one in the center



MOLDS FOR LASTS are made on a four-station turntable. Sand is rammed in flasks by a stationary sand slinger. Excess sand passes through floor grates onto belt that returns it to sand-conditioning equipment. Complete molds ride roller conveyor to pouring station

space could not be had, and applicants for employment were not interested in foundry work.

Thoroughgoing surveys showed where improvements could be made, particularly in the way of more effective removal of dust and fumes, reduction in the amount of physical exertion required of the molders and other workers, and better sanitary facilities. Hence recommendations based on these surveys called for extensive mechanization of foundry operations and the installation of additional exhaust equipment.

Pictures on this and the following pages show some of the equipment that is making this foundry a better place to work.

The new installations have not been in operation long enough to permit accurate comparison of the present and former production costs. Indications are, however, that these costs will show a marked decrease. Production per man has gone up materially.

At the same time it has been definitely established that there is no longer the slightest difficulty in obtaining new workers.

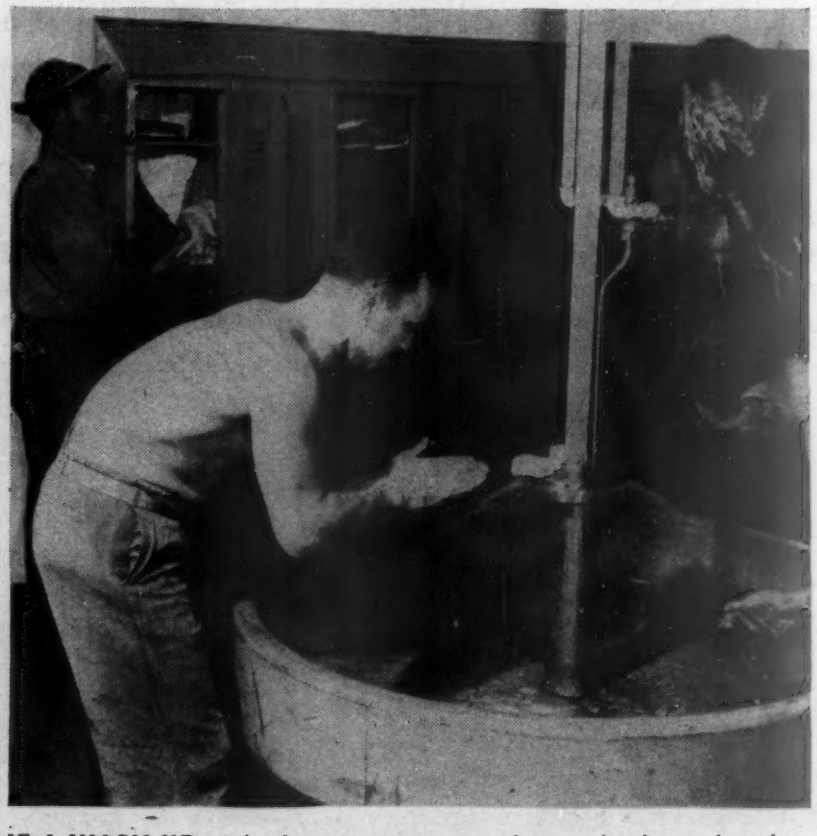
CONTINUED ON NEXT PAGE

AFTER POURING, the molds, still on the conveyor, are pushed along to the shakeout. Air velocity through the grating is 50 feet per minute, 400 through the hood

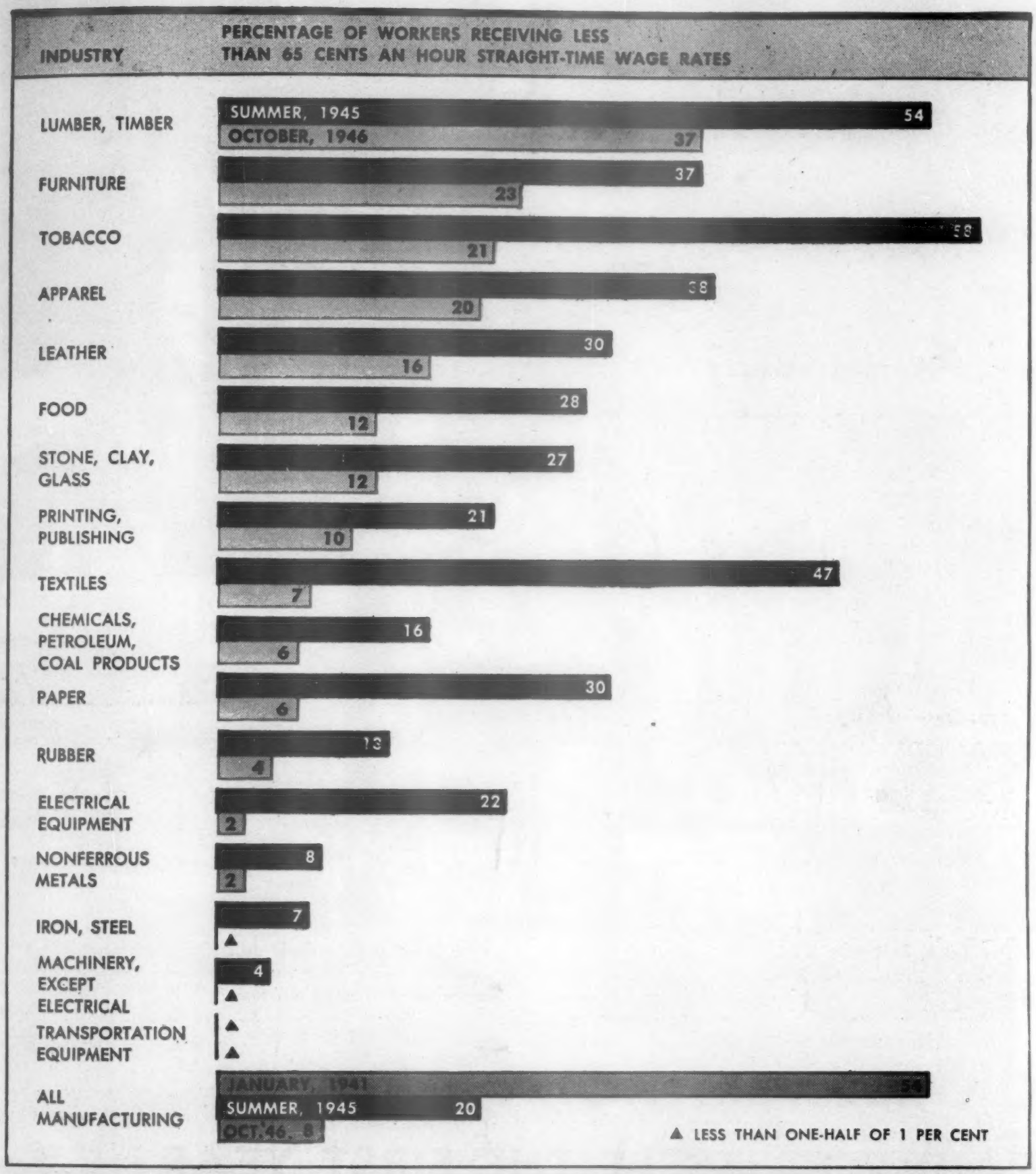
CORES ARE REMOVED from castings by vibrating them in the vertical position in a heavily insulated chamber from which the air is evacuated. Each booth has 6 inches of insulating material on each side

AFTER REMOVAL of gates and sprues, the castings are ground and polished. Parting line seams are ground with hard wheels. Felt wheels and rag buffs are used for finishing. At the wheels, air velocity is 4500 to 5000 feet per minute

OPEN SIDE GUARDS for grinding and polishing wheels are needed for nearly all the work, because of its shape



IF A WASH-UP at the fountain is not enough to make the worker clean and cool, there are shower stalls just a few feet away



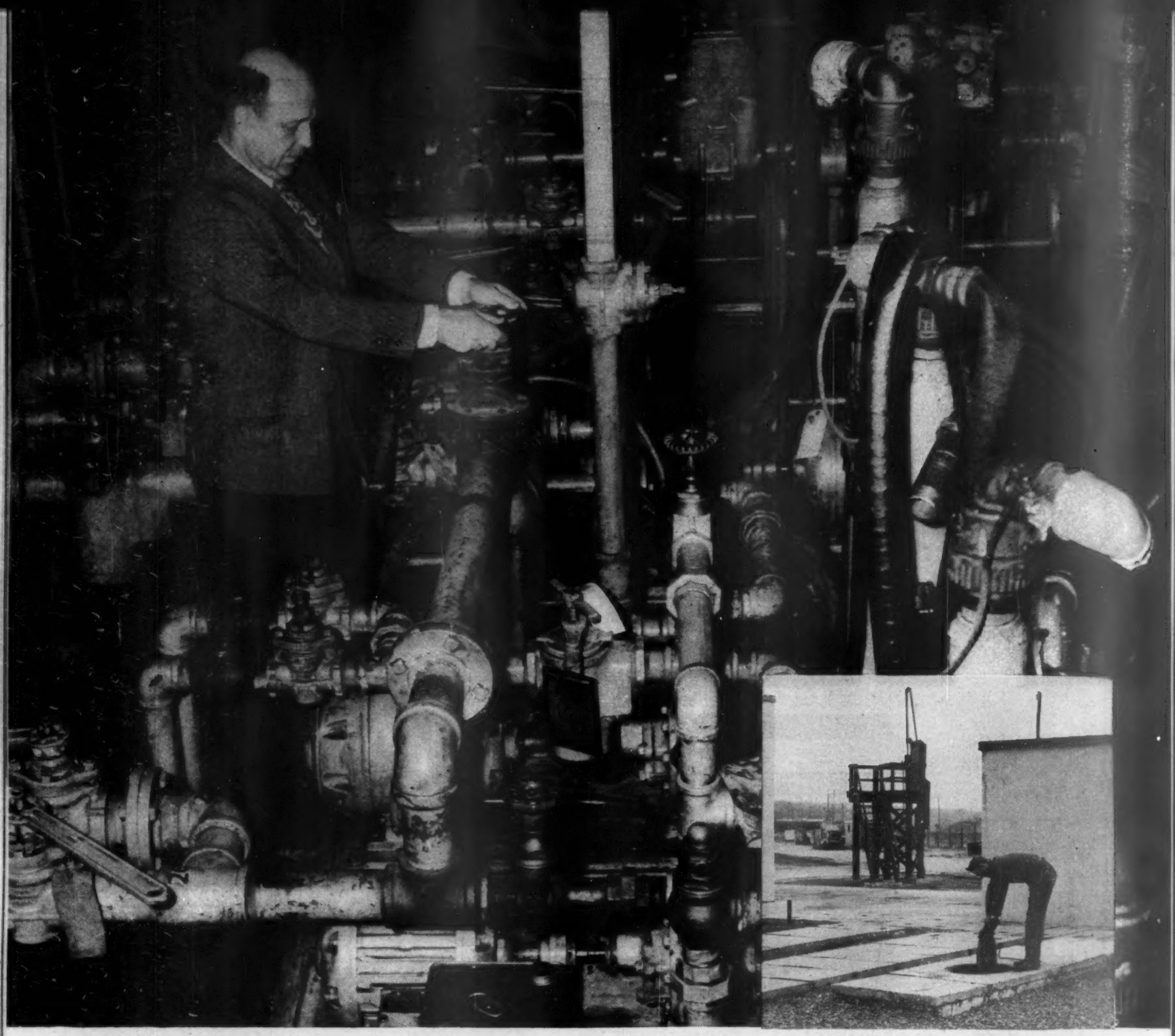
This chart is based on National Industrial Conference Board figures and is published in NICB's series, "Road Maps of Industry"

WAGE RATES IN MANUFACTURING

United States – 1941, 1945, 1946

ONLY 8 per cent of manufacturing wage earners were making less than 65 cents an hour as their basic wage rate in October, 1946, in contrast to 20 per cent of such wage earners in the summer of 1945. Such a distribution represents a radical change from January, 1941, when 54 per cent of manufacturing wage earners were able to earn less than 65 cents an hour.

Sources: U. S. Bureau of Labor Statistics; National Industrial Conference Board.



VALVE ARRANGEMENTS in the oil house permit oil to be discharged through either of two delivery hoses for portable distribution throughout the plant. The underground tank farm of 83 storage tanks is buried under concrete slabs (inset), and provided with manholes to permit direct inspection of every tank. Pipes lead from the tank farm to the oil house

OIL RECLAMATION SYSTEM PAID FOR ITSELF THE FIRST YEAR

HERBERT G. KNELL • PLANT ENGINEER, AND
E. R. KEAST • OIL AND RECLAIM SUPERVISOR, WRIGHT AERONAUTICAL CORPORATION, WOOD-RIDGE, N. J.

Reclamation of petroleum oil products used in machine lubrication or manufacturing operations can yield substantial profits. Where sufficient quantities of oil products are used to make salvage by reclamation practical, the full-scale possibilities for a quick return on the investment in reclamation equipment are not to be ignored. By the same token, the continuing economies also are not insignificant.

At the Wood-Ridge plant of Wright Aeronautical Corporation a modern oil reclamation system more than paid its first cost during the first year of operation. Now in operation for several years, the system continues to pay dividends.

A large part of these dividends obviously can be attributed to direct savings in reduced purchase requirements of lubricants, coolants, and solvents. Some savings, however, have resulted from the better methods of handling these products as an integral part of the reclama-

tion system. Other appreciable savings emanate from improved quality of product made under improved machining conditions, and from lower depreciation of machinery, hence lower maintenance costs, because of cleaner lubrication.

Because of the nature of its business—the design and manufacture of big aircraft engines—this company uses great quantities of petroleum products. Recoverable petroleum products at Wright Aeronautical means thousands of gallons of engine oil for running new and overhauled engines in the test cells. It means kerosene in large quantities for the paint shop, and a standard commercial solvent and degreaser in 100,000-gal. lots for washing engine parts in the shop. It includes 15 different grades of machine lubricating oils, and a few base and blending oils to make the 20-odd cutting oil mixes that are used in the manufacturing areas. It means, too, hydraulic oil, two or three special solvents, transformer oil, and a half-dozen different honing oils.

To handle all these products, plus the gasoline used for testing engines, the storage and distribution system involves 83 underground storage tanks ranging in size from 2000 to 20,000 gallons, miles of piping, scores of valves, large and small portable tanks that can be towed by an industrial truck or pushed by hand around the shop, and dozens of electric pumps. This system takes care of a total of 83 different petroleum derivatives, and has been made so complete that all recoverable oil products are salvaged except greases (which are low in cost and expendable), impregnating and corrosion-prevention mixes, and the water-soluble oils that are used for grinding and cooling.

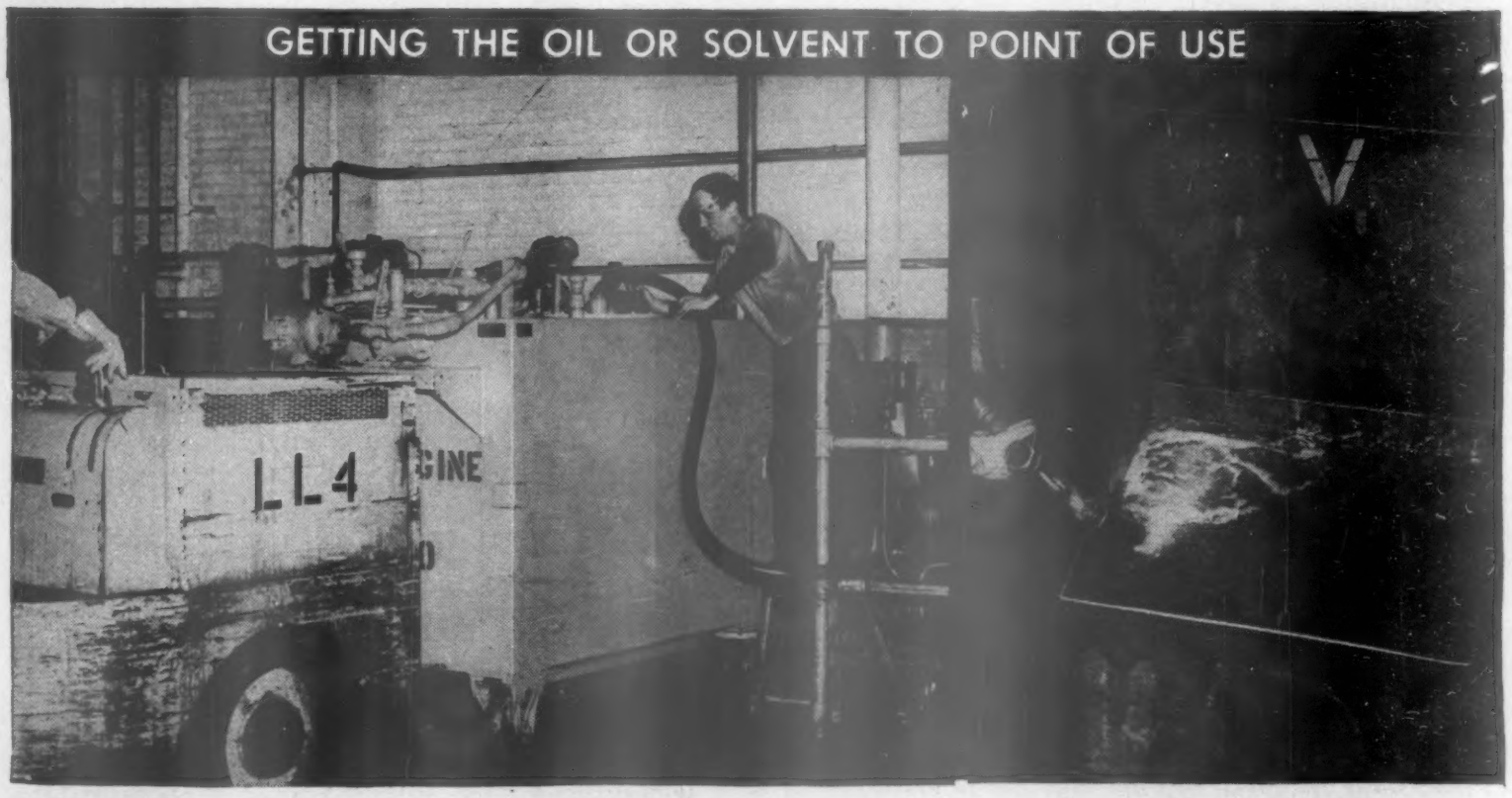
Separating Oil and Dirt

The basic conception of this accomplishment is simple. Under most conditions of use where high temperatures are not involved, petroleum oils do not wear out, although a few unstable hydrocarbons break down to form carbon and gum. The task in successful reclaiming, therefore, is simply one of using mechanical filters and temperature stills to separate the good oil from the dirt, sludge, and diluents that result from normal shop use.

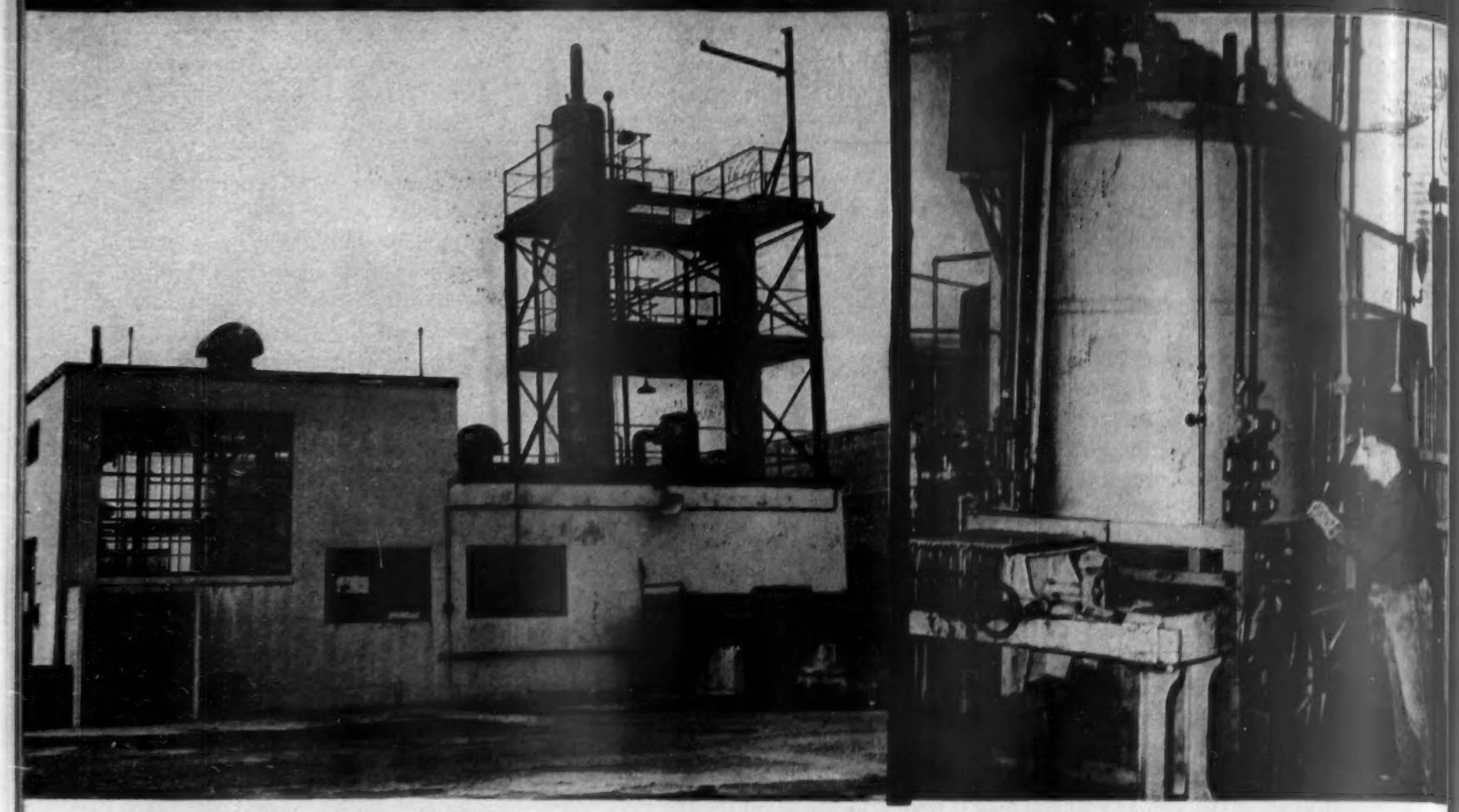
The start of the reclamation system at Wright Aeronautical was rather modest. It was back in 1941 that the company first undertook petroleum oil salvage on a limited basis. Engine oil was the first item to be tried. For this initial step a 60-gal. refining unit was purchased and installed. When this proved successful, cleaning was extended to machine lubricating oils, then to cutting oils, and from there to such other items as transformer and hydraulic oils, and to standard solvents and special ones such as trichlorethylene and carbon tetrachloride. The cleaning process, in turn, led to experiments in the blending of cutting oils, which showed such excellent results that still further extensions of this program are now being studied.

The economic advantages of oil reclamation were obvious from the very beginning. The company saw that by buying in large quantities it could take advantage of bulk prices, and that by continuously cleaning and refining oil, none of it had to be discarded or wasted except that which is lost in normal shop use. It also quickly became apparent that further oil savings could be provided by a high degree of mechanization in the distribution and pick-up of oils and solvents. Today six men efficiently handle the petroleum reclaim and blending requirements for a plant that covers 41½ acres of floor space and employs in excess of 6000 people.

It took somewhat longer to evalu-



OILS AND SOLVENTS not piped directly to point of use throughout the 41½-acre plant are distributed in portable tanks, mostly of the 550-gal. capacity (left). They are filled in the oil house, moved by electric trucks. Smaller trucks are pushed by hand. The large tanks are equipped with a pump (right) for pressure hose delivery to small stationary washing tanks



DIRTY SOLVENTS are reclaimed in a building located in one corner of the plant near the oil house (left). It contains two stills capable of handling more than 12,000 gallons every 8 hours. In the last stage of refinement, oil is passed through a filtering press (right) to separate the dirt and gum and the cleaning agents added to the oil at the beginning of the cleaning process

ate the significant indirect benefits that resulted from such achievements as these:

1. The use of underground tanks effects considerable savings through the return to productive use of floor space ordinarily required for the storage of drums. This, in turn, minimizes drum rental charges, makes possible better housekeeping, and contributes to safety by keeping large amounts of combustibles away from men and machines.

2. Machine shutdown time is reduced by having adequate quantities of oil on hand at all times, including self-mixed blends.

3. The frequent changing of lubricants, economically feasible because of the low oil costs involved, contributes to preventive maintenance, and machine availability is proportionatey higher.

4. Clean cutting oils substantially decrease the number of machine failures, lengthen tool life, and curb the skin rashes to which operators are subject when oil becomes dirty or rancid.

5. The uniform proportioning and mixing of cutting oil reduces the scrap rate.

6. Operators enjoy increased production time because the centralized mixing of all soluble oils frees workmen from this task.

7. By maintaining the identity of all oils through handling in tanks and pipelines, the various types can be properly segregated and reclaimed to the fullest extent.

Storage and Distribution

When petroleum products are delivered to the Wright plant in rail tank cars or tank trucks, they are pumped directly into underground storage tanks at the oil farm. All tanks are buried under concrete slabs, and are provided with manholes to allow direct inspection and check on quantity. For most purposes, however, automatic gages are used for quantitative readings.

In the case of such widely used products as engine oil or the standard solvent, the liquid is piped from the storage tank to the place of actual use. Engine oil outlets, for example, are available in every engine test cell. The standard solvent goes to every one of the company's 145 spray booths, to the automatic cleaning tunnels through which engine parts are passed on mechanical conveyors in the tear-down process after test cell running, and to four other washing machines.

Once the engine oil or solvent has been soiled in use, it is piped back to holding tanks in the oil house on the tank farm for temporary storage until it can be cleaned and renewed. In instances where smaller quantities of oils are involved, portable tanks equipped with a hose and pump are used for delivery from the tank farm.

At Wood-Ridge the oil cleaning equipment is somewhat elaborate, because the number and size of units are dictated by the large variety of oils and the wide range of quantities of each that have to be handled. For its standard solvent the Wright company operates two stills, one that processes upwards of 8400 gallons per day, and a smaller one of a capacity of 3200

gallons per day. A special grade solvent is processed in another still rated at 75 gallons per hour.

Engine oil is treated in a 200-gal. refiner which averages six batches (1200 gallons total) per day. Two smaller units of the same manufacture, each of 60-gal. capacity, also are used, one for treating hydraulic oil and the other for lubricating oil. They process approximately 300 gallons each every 9 hours.

The various cutting oils are cleaned in a commercial 750-gal. batch filter, and in a 300-gal. filter built at Wood-Ridge. The engine-oil refining units can also treat cutting oils, although currently they are not being used for this purpose.

Although the reclamation equipment varies in size and style, the methods of operation are quite simple and inexpensive. Solvents are distilled in a continuous process, with no additional ingredients.

Refinement of lubricating oils, however, is done in batch quantities which are processed through several stages. First, the dirty oil is pumped into a tank where activated clay and other ingredients are added in proper proportions and then agitated to keep them in constant suspension. Simultaneously, heat is applied electrically around the shell of the unit. In this manner the heater does not touch the oil, and there is no possibility of burning. Steam or air is also run across the top of the unit during the treatment to carry off any light volatile "ends" that have been converted into gases. Then, when the oil has reached a predetermined temperature and the chemical refining processes have taken place, the heat shuts off automatically, after which the oil is passed through filter paper in a filtering press to separate the dirt and gum that have combined with the cleaning agents.

Cutting oils are treated in simple straight filters in which heat and sometimes a disinfectant are used.

Once treated by any one of these methods, all the oils and solvents are run into holding tanks to await laboratory analysis before being transferred to other tanks containing oils that are ready for re-use. Because high-precision shop practices are used throughout, and because of the many different varieties and blends of oil in use, laboratory checks on all petroleum products are important to the specific system at Wood-Ridge. Not only is every salvage batch tested, but also every delivery of new oil is examined to make sure it meets specifications.

Different tests are applied to different types of oils, but in general batches are tested for viscosity, demulsification time, neutralization number (a measure of acidity), and residual compounds.

Except for experimental engine tests, reclaimed oil is used as freely as new oil, and experience has yielded no cause to change this practice. Nothing but virgin oil is used when testing experimental engines so that lubricants can be automatically eliminated as a possible source of variables during development tests. This new oil also is cleaned, however, and returned to the production stock.

TYPE OF OIL	GALLONS RECLAIMED IN ONE MONTH	RECLAIM LOSS PER CENT	RECLAIM COST PER GALLON
ENGINE OIL	14,110	2	$0.05
MACHINE LUBRICATING OIL	720	6	.037
STODDARD SOLVENT	102,700	5	.002
TRICHLORETHYLENE	1,113	8	.06
HYDRAULIC OIL	1,680	6	.037
CUTTING OIL (AVERAGE)	3,600	1.5	.005
TRANSFORMER OIL	220	0.5	.025

OIL RECLAIMED, AND HOW MUCH IT COST IN ONE MONTH, TO RECLAIM IT

Costs and Savings

In computing costs and savings, it is easy to demonstrate the economies that result from a comprehensive oil reclamation system. Gross income is simply the number of gallons reclaimed, multiplied by the cost per gallon of the oil that would otherwise have to be bought for replacement purposes. From this, of course, should be subtracted the direct salvage charges and other incidental expenses.

The table above reflects the experience at Wood-Ridge for various oils reclaimed in a recent month, and shows the scope of operations, percentage of loss in treatment of each load reclaimed due to removal of dirt and diluents, and low reclaim costs.

Laboratory expenses for quality tests amount to only a small fraction of a cent for each gallon cleaned. These expenses, however, are applied at Wood-Ridge directly against the replacement cost of oil products. Omitted from these calculations is the cost of burning or dumping dirty oil in instances where reclaim operations are not conducted. Omitted, also, are the offsetting indirect savings listed earlier and the additional economies resulting from blending, a task that is handled by two men operating two proportioning meters connected directly to the storage tanks for the two base oils and the five blending oils that the company buys.

Other than the reclaim loss already mentioned, there should be no physical "leaks" within the system of oil storage, distribution, and reclamation except those normally encountered in manufacturing operations. Because of the great number of items handled at Wright Aeronautical—72 separate oil products, 3 grades of fuel oil, and 8 grades of gasoline—the "shrinkage" is difficult to check.

Shop use, for example, understandably accounts for the greatest lubricating oil loss. Shop use again, plus a high rate of evaporation, accounts for the substantial losses in the solvents, running at Wood-Ridge as high as 28 per cent for the standard grade, and close to 60 per cent for the special grade.

Despite these substantial losses, which can be interpreted as consumption, there is enough residue to make reclamation worth while.

PALLETIZING PERMITS STOCKPILING FOR QUICK SHIPMENT

H. V. LEHN • PRODUCTION MANAGER, I. P. THOMAS & SON COMPANY, PAULSBORO, N. J.

Without its fleet of four gas-powered lift trucks and accessory pallet equipment, the present method of stockpiling heavy bags of fertilizer as a cushion against daily shipping requirements would not be possible.

This is the major conclusion of I. P. Thomas as it contrasts the use of mechanized handling of bags with the old, slow hand-truck method.

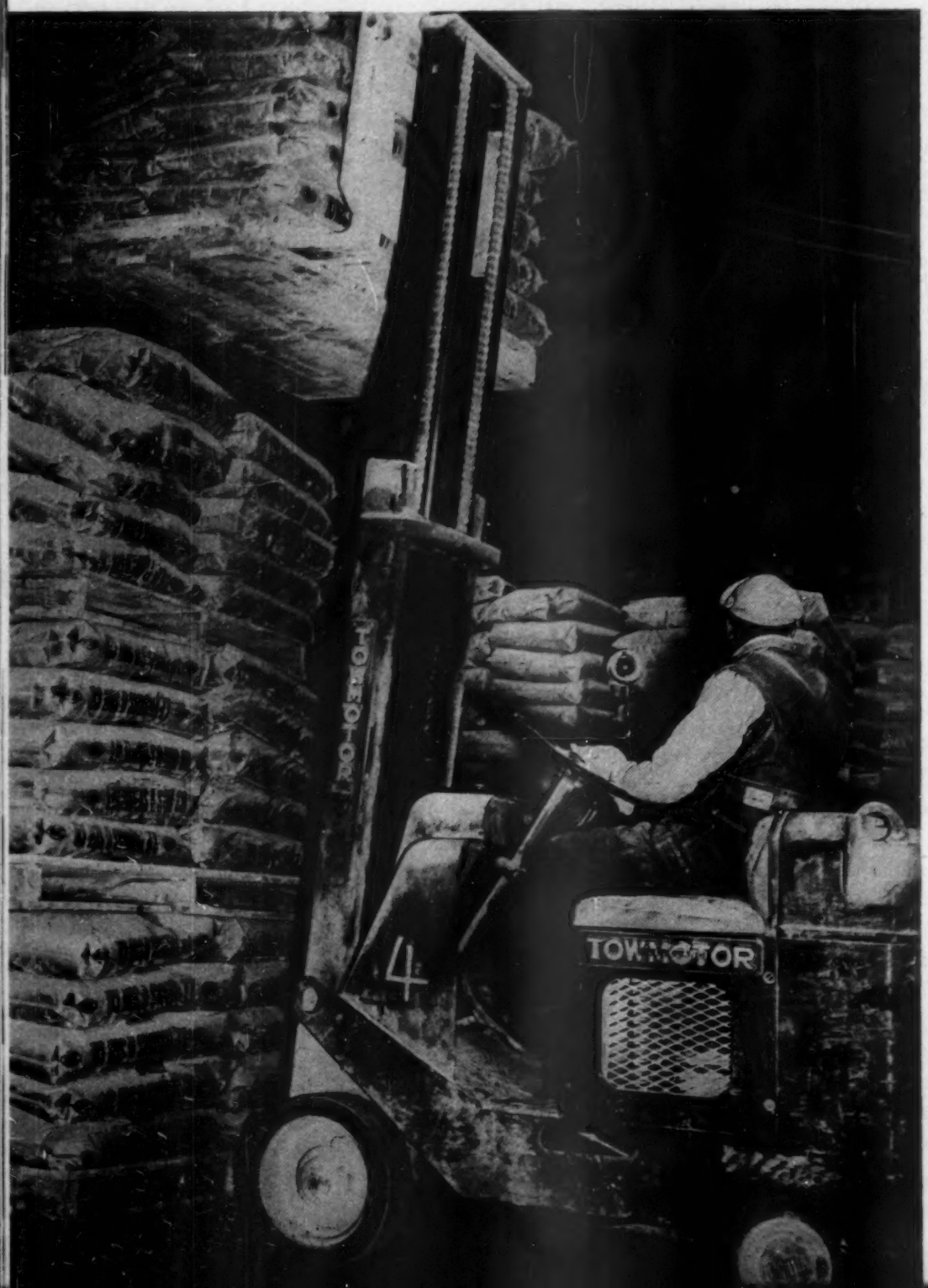
Based on the ability the lift-truck equipment has given to stockpile and remove 100-lb. bags of fertilizer quickly and at low cost, this company has been able to operate its bagging machines more efficiently, and in consequences to smooth out the irregular packaging and shipping manpower loads. Furthermore, by the easier utilization of air space through lift-truck tiering, considerably more bagged stock can be systematically piled according to grades in the limited storage space available.

Viewing the results from the economic angle, manpower requirements for handling bags in packaging and shipping operations have been cut as much as 40 per cent. Customers are pleased, too, because of the faster service in loading their motor trucks.

Some advantages of mechanized handling were known to this company long before the purchase of the lift-truck equipment. For over twenty years large overhead trolley-cranes with ½-cu.-yd. drop buckets have been used to move all bulk raw materials in the manufacturing operations in the plant.

Beginning at the numerous deep, open-top storage bins at the far end of the 400-ft. building, these cranes move the sand-like fertilizer constituents to the "mixing" machine in the center of the plant. From there the completely mixed formulas are similarly moved farther on to other open-top bins at the near end of the building for "curing" and storage prior to packaging and shipping. Each bin of mixed fertilizer holds up to several hundred tons of one grade. Usually about fifteen standard grades, commonly identified in the trade as "5-10-5," "7-7-7," "4-12-4," and so on, are kept in bulk storage, available for shipment.

There has been no change in this manufacturing procedure even now. But from this point on, specifically, after the transfer by the crane bucket of any specified grade from



UP SHE GOES, a 1-ton pallet load of twenty bags of fertilizer, to make a four-tier stockpile in a matter of minutes. It used to take six men hours to pile bags this high

MOTOR TRUCKS are loaded quickly by dropping the pallet load on a dolly at the end of the truck platform. The dolly is then wheeled inside

bulk storage to any one of three similar packaging "mills" for bagging into 100-lb. units, the advent of the lift trucks has led to radical time-saving improvements.

Old Method

Stockpiling of fertilizer in bags was avoided as much as possible. It was too expensive and time-consuming. There was no profit in hand-trucking bags from the bagging mills to storage areas, piling them, and then later unpiling them and hand-trucking them to the carrier for shipment. The fact that the average distance from the mills to the storage areas was only about 125 feet, and from there to the boxcar siding or motor truck loading platform about 50 feet, made very little difference.

Consequently, most orders for fertilizer were packaged only when a carrier was ready to receive the bags directly from the bagging mills. This meant that motor trucks often were kept waiting 6 to 8 hours for their loads.

At normal rate of output each bagging mill required five hand truckers to take the bags away. The customary load for one hand-truck was five 100-lb. bags. Each mill turns out about 150 tons (3000 bags) in an 8-hour day. Only "strong backs" needed to apply for work here, and they were not always easy to get.

If on occasion the bags had to be piled high in storage they were relayed by two to six men, depending on the height, to get them to the top level. An inclined belt conveyor was unusable because of lack of space for its operation. Time, obviously became a big factor in cost of handling.

Efficient operation of the mills also suffered. The almost rigid necessity for packaging "to order" prevented longer machine runs of any one mixture. Hence time was lost in changing mills over from one formula to another. Generally orders had to be scheduled chronologically, rather than for highest machine efficiency, to follow the rule of "first come, first served."

New Method

With the use of lift trucks and pallet equipment the old bugbear of stockpiling of bags has been dissipated. Stockpiling is now a practical and inexpensive procedure which has made possible the advance packaging and economical storage of an average of 200 tons of bag stock of the most popular formulas. Packaging schedules can now be evened out and arranged for longer and more efficient machine runs. Mill changes have been reduced from about three dozen daily to one-third that number.

Loaded on Pallets

As the filled bags come off the mill, they are loaded on a wood pallet capable of carrying five layers of four bags each, or one ton of fertilizer. The lift trucks move the loaded pallets either to the stockpile or to the carrier. They can maneuver into and inside a boxcar directly to the point where the bags are stacked by hand. Because of their own weight, lift trucks do not operate similarly on a motor truck, but deposit the pallets on a dolly at the end of the motor truck platform. The dolly is readily wheeled inside the motor truck to the point of unloading. Two lift trucks can easily handle the output of one bagging mill. Significantly, striplings with reasonable brains and skill can manipulate them.

No pallets are shipped outside the plant, but all are unloaded in the carrier and returned for re-use in the loading cycle. Motor truck waiting time has been cut in half and better. Customers have now learned to telephone in their orders one day beforehand, making it possible to have ready a schedule of packaging operations at the beginning of each day based on stock on hand. In days of light orders, schedules can be arranged to rebuild stockpiles efficiently, now that the excessive cost of piling and removing bags is no longer a barrier. What it all amounts to is that tons of bags can be tiered 20-high (4 pallet loads) or removed from high stockpiles in a matter of minutes instead of hours required by the old hand methods.

It is the versatility of movement, in the company's opinion, that has made the lift-truck fleet particularly adaptable to its own irregular and unpredictable sales requirements. Sales fluctuations now no longer govern packaging operations, because the lift trucks can pile up or unpile inventories at a fraction of the old cost.

HOW PRACTICAL PERSONNEL MEN THINK

Second and concluding part of a penetrating analysis of the Taft-Hartley Act. In it, twenty of industry's best-informed men have drawn on their years of experience and know-how in labor relations. The authors have been given the widest possible latitude, and the opinions they express are not necessarily to be taken as those of their companies

EMPLOYEE VOTING PROCEDURES

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The Labor-Management Relations Act of 1947 brings about several changes in the National Labor Relations Board's past voting procedures for determining representation.

1. Now, only the "secret election" can be utilized by the Board in determining whether or not a union represents a majority of the employees in a bargaining unit. Such an election may be a "consent" election (voluntarily agreed to by the parties) or may be Board-ordered, but the use of a "cross-check" on union authorization or membership cards against the employer's payroll is no longer a valid means of determining questions of representation.

This is a desirable change in procedure, since the true wishes of employees are more apt to be ascertained in a secret election than as the result of a "cross-check." In the latter type of case an employee may have been pressured by his co-workers to sign a union membership card against his will, or may not have understood what he was signing. However, this change is not as significant as might appear on the surface, because in recent years the Board has utilized the secret election instead of the cross-check if any of the parties requested it.

2. There now can be no new representation election within a bargaining unit (or subdivision thereof) within a year after an election has been lost or won by a union. In the past, after losing an election, a union could petition for an election at any time, and some unorganized companies have had production interfered with by almost ceaseless union organizing campaigns. This change will mean a "breather" for all concerned, since the time restriction on the frequency of elections will make it uneconomical, in many cases, for unions to resume an organizational campaign for some months after an election has been lost.

3. Board-ordered elections may now be held only after a formal hearing has been conducted. This nullifies the NLRB's recently adopted practice of holding an election prior to the hearing where there appeared to be no major issues involved and no substantial objections were raised. For the most part this procedural change will mean little to management and merely reverts to an earlier NLRB procedure.

4. As in the past, in any representation election where none of the choices on the ballot receives a majority (of valid votes cast), a run-off election will be conducted. However, under the new law, the ballot (at the time of the run-off election) shall provide for a selection between the two choices receiving the largest and second largest number of valid votes cast in the original election.

This is an important change. In the past "no union" appeared on a run-off ballot only when more employees voted for "no union" than for *any* individual union in the original election. Under the new law, employees will have a chance to vote for "no union" on a run-off election if "no union" has received either the largest or second largest number of valid votes cast in the original election. This change places the Board's procedures more in line with the usual practice of American political elections.

5. Employees on strike (who are not entitled to reinstatement) are not eligible to vote. Thus, employees who have struck as the result of a

THE LABOR LAW WILL WORK

breakdown in contract negotiations, and who have been replaced by others, are not eligible to participate in the balloting (provided the employer has not committed an unfair labor practice during the strike). This is contrary to recent Board policy.

In the average industrial situation this rule will mean little to management. Most contract negotiations end satisfactorily to the parties without a work stoppage. Where there is a strike over economic issues it is usually settled with the proviso that all strikers are to be reinstated "without prejudice."

However, even in those cases where this phase of the law is applied, it will doubtlessly prove confusing and difficult to administer. If an employer has been able to find replacements for three of five striking punch press operators, which of the five were replaced? Also, who makes the determination and what criteria do they use? None of these questions is answered directly or indirectly by the law.

6. Under the NLRA, an employer could petition the Board for an election only when two or more unions had presented demands for representation rights covering the same group of employees. Until such dual demands were presented to him, an employer could not effectively request the Board to conduct an election.

Now, when an employer receives a request for recognition from one or more unions he can file a petition with the Board requesting that an election be held to settle the matter. Under the law the Board is prohibited from distinguishing between employer petitions and those filed by a labor organization.

Although a great hue and cry has been raised by some of organized labor's spokesmen over this phase of the law, nevertheless its practical effect will be almost nil. It has been argued by some that labor unions will be broken by anti-labor managements petitioning for elections before the union is ready. Since the employer can only petition the Board for an election *after* the union has "presented to him a claim to be recognized," it would appear that the union and not the employer can control to a very real extent the timing of the election.

It is also difficult to see any advantage, in most cases, for an employer to be able to petition for an election after a union has requested recognition. Usually the union has done this as a matter of course. However, some few unions, such as Teamsters, have in the past been reluctant to utilize the Board's procedures and after an organizing campaign have merely demanded bargaining rights of an employer. If the employer did not recognize the union, such unions then typically "hit the bricks" to win recognition. In this situation, now threatened by some labor leaders, the employer can petition the Board for an election, but since the union, if it chooses, can also still resort to strike action to gain recognition, the employer will have gained nothing, practically speaking.

7. Under the old NLRA, a union once certified by the Board remained the bargaining agent for the employees of a given unit indefinitely. In an effort to stabilize labor relations, the Board refused to consider petitions during the first year or two after the original certification. As time went on the certification remained in full force and effect unless a rival union filed a petition indicating a "substantial interest," or the employer refused to continue bargaining with the original union. In the former case, the Board normally conducted a hearing followed by an election. In the latter case, before proceeding with an unfair labor practice charge, the Board forced the union to prove that it still retained a substantial interest among the employees. Often this resulted in a Board-ordered election to determine whether or not the employees in the unit still wanted to be represented by the union.

Under the new law the foregoing does not substantially change. However, individual employees, groups of employees, or any individual or labor organization acting in behalf of the employees may petition the Board, requesting an election in order that the bargaining representative may be "decertified." Apparently, such a petition must be backed by a showing of "substantial interest." In other words, it appears that roughly 30 per cent of the em-

Last month **Collective Bargaining Negotiations, page 86 • Jurisdictional Disputes, 88 • Grievance Procedures, 89 • Featherbedding, 90 • Right of Free Speech, 91 • Illegal Strikes, 92 • Compulsory Union Membership, 93 • Damage Suits By and Against Unions, 94 • Check-Off Procedure, 95**

This month **Employee Voting Procedures, page 84 • National Welfare Strikes, 86 • Rights of Individual Workers, 87 • Secondary Boycotts, 88 • Determining Bargaining Units, 89 • New Mediation Board, 91 • Political Contributions, 92 • The Foreman's New Status, 93 • Welfare Funds, 93 • Company-Dominated Unions, 94 • The New Labor Relations Board, 95**

ployees would have to sign a petition stating that they no longer want the union in question to represent them, before the Board will proceed to a formal hearing and subsequent election.

In terms of the practical realities it appears that it will be easier for *employees* to get rid of a union than heretofore. However, this may well prove a mixed blessing for management. Assuredly, easy-going unions will be forced to press more vigorously for the so-called "pattern demands" secured by the larger, stronger and more aggressive unions; and all unions will be forced to pay more attention to radical minority groups within their own organizations in order to prevent dissident minorities from seeking decertification. Once a union has been "decertified" many managements will find that it will not be all "tea and cakes." Undoubtedly some aggressive unions will then strike to regain bargaining rights and others will intensify organizing efforts looking forward to the next election a year later. In either event management doubtless will suffer loss of production.

NATIONAL WELFARE STRIKES

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It was not many months ago that this nation found itself practically defenseless in the face of strikes that affected our national welfare. To what extent, then, has the LMRA corrected this situation?

Very briefly, the Act establishes the following procedure: Whenever, in the opinion of the President of the United States, a threatened or actual strike affecting an entire industry or substantial part thereof will imperil the national health or safety, he may (a) appoint a board of inquiry to inquire into the issues involved, and upon receiving a written report of its findings (b) direct the Attorney General to petition the district court to enjoin the strike.

Through use of the temporary injunction, the President is now empowered to prevent such a strike for up to 80 days, during which time he is to make available to the public the initial and the final findings of the board of inquiry appointed by him—the parties, meanwhile, making every effort to settle their differences with the assistance of a new and independent Mediation Service, and finally the employees affected are to ballot secretly on acceptance of the employer's last offer. Failing a settlement, the President would then report to the Congress, which would consider the matter and take "appropriate action." Incidentally, if the Congress was not in session at the time, there appears to be nothing in the Act to prevent the President from starting the procedure all over again, if he deemed such action necessary.

Will the procedure work? Will the Act prevent nation-wide, paralyzing strikes in the future? This remains to be seen. Too much depends upon the willingness of the parties to arrive at a peaceful settlement while the procedure outlined in the Act is followed. The Act is specifically designed to permit a peaceful settlement during an 80-day delay of the actual work stoppage. Meanwhile, the President may utilize the forces of public opinion by making available to the public the findings of the board of inquiry. By the way, the board of inquiry bears no resemblance to the so-called "fact-finding" boards of last year, as the law provides that the report of the board of inquiry shall not contain any recommendations.

Does the Act apply to all strikes that affect the health and welfare of the public? The answer appears to be in the negative. Only those which affect an entire industry or a substantial part thereof *and* would imperil the national health or safety appear to come under the provisions of the Act. Therefore, it is not likely that a strike by the employees of the only power company serving a given city or community, or even a general strike of all services in a given city or community, would be held subject to coverage by the Act. On the other hand, industry-wide stoppages in coal or steel would certainly be covered.

What about the cry of "involuntary servitude" which arises whenever mention is made of injunctions to prevent or end strikes? This charge is absurd. In the first place, the injunction only applies in strikes endangering the national health and safety. Certainly the public, which really suffers in such cases, should be entitled to an 80-day stay of execution, and is also entitled to know about the progress being made in settlement of the dispute, together with the attitudes and positions of the parties during the 80-day period. To those who cry "involuntary servitude," the Act carries a saving provision which recognizes the Constitutional protection against compelling any individual to perform work or render service against his will.

The provisions of the law relating to national emergencies deserve a decent, fair trial by both parties to any dispute coming under its jurisdiction. The far-reaching effects of such a dispute deserve special consideration in order to protect the interests of employee, employer, *and the public*. The law applies only to strikes of nation- or industry-wide import. I should like to see it apply in case the water, gas, or electricity is shut off in my home and the homes of everyone else in my community.

The law does not encroach upon the rights of either employer or employee. The law, as it stands, pro-

vides for no arbitrary decision by any court, board, or agency. Settlement of the dispute is arrived at between the two parties involved, while the interests of the public are being served. Wouldn't it be smart for both labor and management to make the new law work?

RIGHTS OF INDIVIDUAL WORKERS

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YORK CORPORATION, YORK, PA.

Above and beyond what the LMRA does to management or union leaders, the introduction of a new factor, "the individual employee," may be the most unpredictable and disruptive of the parties concerned. Whether this Act stabilizes the industrial and labor relations of industry in the country, or creates confusion, or turns out to be a complete failure, will depend in great measure on the skill of those responsible for its administration. The job of administering this Act will be greatly complicated if this "individual employee," now armed with certain rights, decides he ought to try out his new-found importance.

The intent of the Act was to dignify the "individual employee," and free him from coercion from any source; to make American workmen independent of force from either unions or management; and to put the employees, as individuals or as groups of individuals, in a position of control.

Most of the prohibitions, on the part of the unions, are not prohibitions in their activities with the employer, but prohibitions in the handling of their own members. The new legislation affords the individual workman the same protection against unfair labor practices by *either* employers or unions. It grants the indiyidual employee the right to join *or refrain from joining* and assisting a labor union, and it makes it an unfair labor practice to restrain the worker in the exercise of this right by the employer, the union, or their agents.

The law gives the "individual employee" the right to present his own individual grievances, without interference on the part of the union, or its agent, and he can, if he wishes, come to an agreement with the employer, as long as this agreement is not in contradiction to the terms of the labor contract. A union delegate may be present, but he cannot control the terms of the settlement (see "Grievance Procedures," page 89, August FACTORY). This will give a great many employees, who were not members of unions in plants, an opportunity of getting fair treatment as far as their own individual grievances are concerned. In the past it was pretty hard to convince a union delegate that he should carry the grievance of a non-member with any great amount of enthusiasm.

The limitation on the time provided for the entering of charges on unfair labor practices should not injure the individual employee in his right to get fair treatment or to correct abuses. It will, however, force the employee to make up his mind, and will eliminate the privilege, which he has had in the past, of coming into a meeting long after the action has been forgotten by members of management, and reminiscing on injuries, either actual or supposed.

From a practical standpoint we can anticipate a great many instances of arguments between the employer and employee and the union as to the date of certain action, especially where the complaint has gone through a long complaint procedure. But there is nothing in the Act to prevent the union or the employee from filing a complaint with the NLRB prior to the 6-month time limitation and having this run concurrently with the complaint procedure.

It is understood that this practice will be followed by some unions, and we may find the NLRB will be working on complaints after they have been settled under the normal complaint procedure in a contract.

The restriction on picketing is not very clear in the law; in fact, there is no provision in the Act which mentions a specific limitation on picketing as such. However, there can be little doubt but that Congress intended that the individual employee would be protected from the old practices of mass picketing and "roughing up" that went with strikes. The fact that the union established a mass picket line would not in itself be prohibited except as it became an unfair labor practice because it was determined to be an instrument of coercion.

The prohibition reads:

"It shall be an Unfair Labor Practice for a labor organization or its agents to restrain or coerce employees in the exercise of the rights guaranteed in Section 7."

The words "interfere with" were deleted because Congress was afraid that "interfere with" would have to be defined and thereby be limited. It would seem, therefore, that a fair assumption of the intent of Congress is that any employee would have recourse to the NLRB for relief in any instance where a mass picketing line was established, because it would seem reasonable to believe that its very existence would constitute coercion or restraint.

Under the new Act, it is an unfair labor practice for the employer to accede to the demand of a union to discharge an employee in a union shop, except for failure to tender initiation fees and dues to the union, thus protecting individuals against the caprice of union leaders. A majority of employees eligible to vote must approve a union shop agreement. This eliminates the possibility of a deal between a union leader and an employer, disregard-

ing the attitude and feeling of an individual employee.

Under the sections of the Act concerning the right of petition by employer or union, there has been added also the right of petition for decertification of a union by employees themselves. This will occur only in a case where the employees feel the union then representing them has lost the majority status. Contrary to the provision for *establishment* of the union shop, only a majority of those who vote are needed to carry this issue.

A great many times union leaders, in their negotiation with the employees, have felt that they could make a deal with the employer for a union shop, and thereby insure themselves of dues income and promise the employer a greater security, because of the control the union leaders would have over the employee group.

The financial aspects of union organizations have always been rather indefinite, and, although a great many of the better organized unions have issued annual financial statements, there have been a great many of them that have not been so well organized, and their leaders have access to the finances of the union, without making any report to the members as to the disposition of the money collected. The Act protects the individual employee from misuse of union funds, and assures him of his proper equity in union welfare funds.

No one knows the results that will come from the exercise of these rights, but it is possible to conceive of some circumstances where the "individual employee" in his new legal standing can attain great importance to both the employer and the union. And after the last dozen years of restraint on his activities as an individual, his independence may assert itself in a virulent form. With the protection of the new Act and the specific rights granted him, it may very well be the individual's turn to enjoy the center of the stage, rather than either the employer's or the union's.

SECONDARY BOYCOTTS

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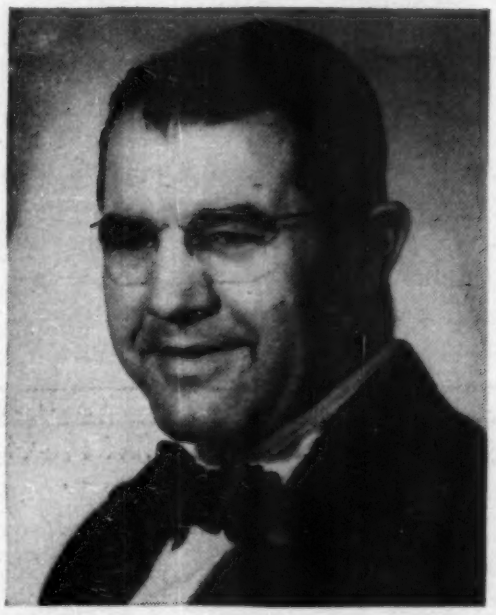
BIGELOW-SANFORD CARPET COMPANY, NEW YORK



The secondary boycott, one of the most debatable subjects throughout the history of labor and labor legislation, is banned by the LMRA as an unfair labor practice.

Actually, by including the boycott ban in the bill, Congress has given the nation cause for debate on one of the most insidious problems in the labor-management relationship, and has saddled the NLRB with a major problem in enforcement.

As complicated as the meaning of "boycott" has become in our time, the schoolboy definition, "a collective refusal to buy specified products," is still commonly known. The LMRA describes the boycott as a concerted refusal in the course of employment to use, manufacture, process, transport, or otherwise handle or work on any goods, articles, materials, or commodities, or to perform any services.

It is difficult to say what is a primary and what is a secondary boycott. The secondary boycott is supposed to be that invoked against a third party, not involved in the basic dispute, to induce him to stop buying boycotted goods. Actually, the boycott almost always has involved a third party.

The primary boycott is not banned by the Act unless it is engaged in for one of the four unlawful purposes set forth in the ban on certain strikes. For this purpose, the law considers the boycott a partial strike. The secondary boycott is always bound to come under the "unlawful purposes" and therefore, in fact, is wholly forbidden.

Although generally condemned, boycotts were earlier legalized in some states. With no specific, enforceable law, boycotts have continued, but not so fearlessly open as in our early labor history. In conflict with the common law, the Norris-LaGuardia Act permitted boycotts. The LMRA represents the first real effort to deal effectively with undesirable practices that, *sub rosa,* have had a major effect upon the nation's economic well-being.

The Sherman Anti-Trust law long ago outlawed boycotts in restraint of trade among manufacturers.

Just as the Act condemns certain strikes, it makes the secondary boycott an unfair labor practice, makes it subject to high-priority injunctions, and renders participants liable to damage suits.

The acid test of the law as to whether it will effectively do what is intended, lies in the willingness of employers to use the machinery set up. The transformation of the words of the new law into workable practices is difficult throughout. The boycott ban is no exception.

Will wronged employers use the injunctive procedure provided, and will they seek to recover damages when the secondary boycott is applied against them? The probability that they will not is the reason the section of the law dealing with boycotts becomes one of the most difficult of enforcement. The administrative procedure in using the injunction is too cumbersome for rapid action.

Two points require heavy emphasis in connection with future thinking about enforcement of the ban on boycotts.

The first is that some employers and employer associations in the past have developed monopolistic positions by the actions of unions with which they dealt in applying secondary boycott practices. There is a question as to whether they want to disturb their positions.

The second point, which applies

far more generally than the first, is that economic force may work against the machinery of the law.

1. Employers and employer groups may be coerced into not taking action.

2. Those that do take the necessary action will find themselves confronted with the problem of proof.

Some of the problems arising from the boycott ban are emphasized by this quotation from the report of the Senate Committee on Labor and Public Welfare:

"The committee bill admits that such boycotts and strikes are improper, but it only proposes to make them unfair labor practices. This means that appeal must be made to the NLRB. The bill does provide that, on petition of the NLRB regional attorney, the Board may obtain a temporary injunction from a court while it is conducting a hearing on the question whether the strike is an unfair labor practice or not. If it finds that it is, it then may issue a cease-and-desist order against such a strike and later ask to have this enforced by the court. In our opinion, this is a weak and uncertain remedy for those injured by clearly illegal strikes."

Picketing with respect to a secondary boycott is less coercive than the boycott itself. The new law specifically protects the rights of employees to refuse to enter the establishment of an employer, other than their own, if the other employer's employees are engaged in an authorized strike.

Picketing therefore can have the force of a boycott even though no actual boycott is declared. Any effort to interfere with that right immediately raises the question of the constitutionality of the law which is in question.

From the viewpoint of employers, and certainly from the viewpoint of our national welfare, the banning of secondary boycotts is a provision that has been needed in our code of law for many years. Enforcing the ban is a major problem. The machinery has been provided. Regardless of how difficult or distasteful the task may be to employers, the burden of obtaining enforcement falls on them.

DETERMINING BARGAINING UNITS

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Under the Wagner Act, the NLRB consistently held that management could not refuse to bargain with a union negotiator merely because he was an "outsider" or because management could not get along with him. The contrary was not true. While the NLRB had authority to hold against management that such refusal constituted an unfair labor practice, it lacked similar authority with respect to unions.

The LMRA now makes it an unfair labor practice for a labor organization or its agents to restrain or coerce an employer in the selection of his representative for purposes of collective bargaining or for the adjustment of grievances.

This means employers and unions now have the same obligation to discuss and try to compromise their differences with those whom they appoint, or who act as their agents. Neither the union nor the employer can now dictate or indicate the personnel with whom it will bargain. Thus unions or their agents will now be prohibited from seeking to induce competing companies to accept so-called "master agreements" on a take-it-or-leave-it basis.

The same provision will also prohibit unions from forcing an employer to bargain through an association if he chooses to bargain separately. As a practical matter, however, many employers ordinarily prefer to bargain through associations, so that the full effect of the law on industry-wide bargaining cannot yet be clearly foreseen.

The probable effects on "craft" groups such as professional workers and guards are somewhat more clear-cut. In mass production industries, many crafts have, in the past, been included in plantwide bargaining units. Wherever separation is desired, the NLRB is now compelled to conduct separate self-determination elections. It will probably still be necessary for groups seeking a craft unit designation to prove: (1) That the work is separable from the work of other production employees; (2) that separate supervision is required; (3) the existence of apprenticeship; (4) that there is a substantial difference in pay from other employees.

Professional employees are now automatically given an opportunity to vote separately on whether or not they wish to be included in a unit with production or clerical employees; the old law left this matter to the discretion of NLRB. This rigid separation may create some new problems for management.

Plant guards, armed or not, who have a certain amount of rule-enforcement authority, must now be placed in a unit separate from rank-and-file employees. However, night watchmen who simply make rounds of property will probably be included in the bargaining unit with production and maintenance employees. This remains to be seen.

In determining whether or not a question of representation exists, the same regulations and rules of decision will now apply irrespective of the identity of the person filing a petition or the kind of relief sought. Thus the Board may no longer deny a labor organization a place on the ballot by reason of the fact that it (or its predecessor) was charged as being company assisted. The single exception occurs in the case where the Board finds the union to be company dominated and after a formal hearing orders it disestablished.

In the past, the Board's policy has been to deny labor organizations a

place on the ballot whenever a charge was pending alleging that an unaffiliated labor organization was company assisted. Frequently these charges were made for dilatory purposes only. This strategy had the effect of forcing the unaffiliated union to withdraw its petition. After the petition was withdrawn, the rival union would then withdraw its charges and file its own petition. In this way the first petitionary union would be kept off the ballot. This should no longer be possible, since section 9(c)(2) now provides for equal treatment of all unions.

The matter of disestablishment thus assumes new importance in any attempt to keep a union off the ballot. Under the Wagner Act, the Board's policy was to order disestablishment of almost any independent union which was found to have been company assisted in its formation. On the other hand, the Board seldom considered company assistance in formation grounds for disestablishing an affiliated union. Unaffiliated unions were therefore at a distinct disadvantage. While we may be certain that this inequity will be removed, it is not yet possible to say in which direction the Board will move to accomplish this. It seems likely that somewhat less stringent rules will be applied to independent unions, but the possibility of a "tougher" attitude toward company-assisted *affiliated* unions cannot be eliminated.

These new rules with respect to special groups, and the "equal treatment" requirement, pose two important questions:

1. What tests may the manager apply to insure that he does not commit an unfair labor practice by recognizing or refusing to recognize a particular group as a separate bargaining unit?

2. Under what conditions may employees or groups of employees request and reasonably expect to obtain elections among special groups?

To answer these two questions completely would require an analysis of all the complex situations that may arise when recognition is sought. To accomplish this would be an endless task.

It can probably be said that it would be considered an unfair labor practice under the new law to recognize any union not properly certified by the NLRB, inasmuch as an employer may now file a petition for an election after getting a claim from a union demanding recognition.

In recent weeks, however, there have been reports of agreements under the terms of which the company and union conducted an "election," under bipartisan supervision and without the intervention of the NLRB, to determine whether or not the union represented the majority of the employees. Management agreed to recognize the union as exclusive bargaining agent if it could show a majority. Under such circumstances, management leaves itself open to challenge at any time. However, if the election is conducted by the NLRB, management is assured of at least one year of stable relations.

It is still too early to say how widespread this practice may become, or what may be its final effect on labor-management relations.

Breaking Up Units

If a particular group wants to separate from an existing bargaining unit or the employees of an entire unit wish to be certified, during the term of a valid collective bargaining agreement, they should be directed to the NLRB. However, the chances are that the Board will not honor their petition, as the law requires a minimum period of stable relations of one year to a possible maximum of two or three years.

If, at the expiration of a contract, request for recognition of a separate unit is made by a craft group desiring separation from a plantwide unit, petition may be filed with the NLRB requesting a separate self-determination election. Likewise, if, at the expiration of a contract, the employer is in doubt as to the continued majority status of the certified unit, he can petition the Board for a new election before proceeding to negotiate a new contract. If a union organized the workers in the first instance, either it or the employees may file petition for certification at any time a substantial amount of employee support can be shown. In all probability in these situations the NLRB will continue to insist upon the showing of the wishes of 30 per cent or more of the employees in the unit before proceeding with an election.

As in the past, when the union and the employer are in complete agreement as to the scope of the unit and all other questions, they may enter into a stipulation for a consent election. Payroll checking or a check of union authorization cards is banned under the new law. If it is apparent that the union does represent a substantial majority, little would be gained by holding out for a direct election unless there is ground for questioning the appropriateness of the bargaining unit.

Perhaps the most troublesome request for recognition is the one which comes from a small nucleus of employees in a department who ask to be recognized with the reservation that the scope of the unit will be enlarged as unionization progresses. Under the Wagner Act, the NLRB would certify such a union as a representative of these small groups of employees if it was the only union organized. Such "bridgehead" bargaining units are impossible under the new law. If a labor organization now organizes the workers of a plant, it must claim the entire plant or craft as the unit, otherwise no appropriate unit will exist. In the past, the employer could petition only if two unions were organizing the same group of employees. Now he can petition although but one union is organizing his employees.

The objectives of the Act in providing for the possibility of separate representation for specialized groups are sound. However, a certain amount of caution and common sense must be exercised if these provisions are not to prove disruptive rather than beneficial.

It would not be wise, for example, for an employer to attempt to promote the separate unionization of a group within the present bargaining unit by demanding an election. Such tactics would cause only resentment on the part of the union. Likewise, in the case where a union is attempting to organize the employees, the employer should not force the union into an election before it is ready. Not only would

such a procedure cause ill-feeling, but it might also result in sufficient unrest to give the union grounds for filing an unfair labor practice charge.

The intent of the Act was to give individual employees greater freedom of choice in their selection of bargaining agents. The employer who accepts that intent and works with his employees toward that end, rather than attempts to "use" the Act to fight present or prospective unions, has everything to gain and nothing to lose in the eyes of his employees.

NEW MEDIATION BOARD

JOHN R. BANGS, GENERAL MANAGER OF INDUSTRIAL AND PERSONNEL RELATIONS,* THE BUDD COMPANY, PHILADELPHIA

One of the most important functions carried on in the past by the Department of Labor has been the Conciliation Service. This service tried to persuade the unions and management to settle their troubles peacefully. But, under the LMRA, the Conciliation Service is eliminated, and in its place is established a new agency—the Federal Mediation and Conciliation Service.

The function of this new service will be very much the same as the old Conciliation Service except that it will be entirely divorced from the Department of Labor.

The new Federal Mediation and Conciliation Service will be headed by a director, appointed by the President. He will take over the duties and responsibilities of the United States Conciliation Service and any mediation and conciliation functions of the Secretary of Labor, absorbing them under the new Act.

The new service is supposed to be independent of any other official except the President, the director being given various duties but no power of enforcement. His function is apparently designed to exist, much after the manner of most industrial personnel departments, on merit alone. If the service under his direction can persuade companies and union representatives into a peaceful settlement of their quarrels, then his job will have been accomplished; if not, he can only move out to enter another situation and try again.

In order to prevent or reduce interruptions in the free flow of interstate commerce by labor controversies, and in order to assist the parties to such labor controversies to settle their disputes during the 60-day "cooling off" period required by the Act, the director may proffer his service where, according to his discretion, it is needed, but he is directed not to do this in the case of small or insignificant disputes.

Also, either the employer or the union may ask the service for assistance, and if the director feels that the dispute would be of sufficient magnitude he will assign someone to attempt to bring the parties to agreement. If he fails to persuade them to settle the dispute without strike, lockout, or other coercion, he is to try to induce the parties to submit the employer's last offer of settlement to the employees for approval or rejection by secret ballot.

If, however, the parties do not agree to do this or any other procedure suggested by the director or his agent, there is no violation of any duty of obligation under the Act. This is for the purpose of preserving our American capitalistic way of life and avoiding too much governmental interference in business—an absolute necessity.

There is also created by the Act a National Labor-Management Panel of twelve members, six from management and six from labor. This panel is to serve in an advisory capacity to the director on such matters as avoidance of industrial controversies, and the best manner in which to settle voluntarily such industrial controversies as do arise affecting commerce.

The President is also empowered to appoint special boards of inquiry when major problems arise, such as a nation-wide strike or lockout. These boards are authorized to hold hearings, call witnesses, and the like; and the reports of such boards of inquiry are to be made public. As a result of the report of any such board, the President may direct the attorney general to petition any district court having jurisdiction to enjoin such strike or lockout, or its continuation. This is the only real power in this section of the Act. It is to be exercised only when national catastrophe threatens, and it puts the power to act in the courts where it belongs.

Now, what contributions will these boards make to industrial harmony? We believe the National Labor-Management Panel can succeed only if it is not used for political purposes. There undoubtedly will be benefit from having top labor and management representatives in frequent sessions in an effort to improve general labor-management relationships. Frequent, calm interchanging of ideas is always good, particularly when no so-called "hot" subject is before them, and their discussions are consequently free from tension.

The President's boards of inquiry have power behind them and, when great national hardship would result from a major strike, they should be able to be of material benefit, but it may take force until their prestige is established.

The Federal Mediation and Conciliation Service can succeed only where those assigned to the dispute are able, by extremely clever induction, deduction, or persuasion, to quiet "troubled waters." Where one or the other of the parties lacks the desire to settle the dispute amicably,

*With the collaboration of James Townsend, personnel manager.

and would prefer for one reason or another to foment trouble, it can never succeed.

The director will be faced with a real challenge. He has no power to act, either to remedy bad situations or to defend himself. Either side can ignore him or his service. Perhaps this is as it should be, for we firmly believe it is better that government stay out of all but the major industrial disputes.

POLITICAL CONTRIBUTIONS

B. F. McCLANCY, DIRECTOR OF THE HUMAN RELATIONS DIVISION
ATF, INCORPORATED, ELIZABETH, N. J.

The ban on political contributions or expenditures by unions or employers contained in the LMRA will have no direct bearing on industrial relations.

From a strictly legal point of view, I believe the ban will be held constitutional. Corporations have long been prohibited from giving money to political campaigns, and labor has grown to such size that it was only a matter of time until attempts were made to restrain it.

Of course, this does not mean that labor unions will be unable to continue their political activities. Even if the law is strictly enforced, there are ways to get around it. I think it is a reasonable assumption that if a union chose to endorse a political candidate in, say, a newspaper advertisement, its dues could be broken down on a basis of so many dollars for dues, and a so-called "voluntary" subscription to pay for the cost of the ad. I have no doubt that a union leader, if he wished, could exert sufficient pressure on the members to secure enough of these "free will" gifts to carry on political campaigns in very much the same manner as in past years.

Nevertheless, I am convinced that the ban on political contributions by unions was a shortsighted step. The Taft-Hartley Law was enacted, so its proponents say, to protect the public from the quarrels of labor and management, the union member from the dictatorship of his own organization, and labor and management from each other. I rather suspect the section on political contributions was put in to protect the congressman and his job.

Frankly, I don't like the ban. Not for what it will do in the immediate future, but because it is potentially dangerous. It has established the machinery which could effectively gag a large part of our population. While I approve sincerely of its objectives, which are to prevent well-organized minorities from exerting an influence on government out of proportion to their actual strength, I am skeptical that they can be accomplished in this way. In fact, the very opposite is likely to occur, and Congress may have placed in the hands of the extreme left valuable ammunition for propaganda.

Any law that regulates, or can be made to appear to regulate, a particular group in our society, solidifies that group in opposition to it. Those elements of labor who thrive on unrest, and strive constantly to make every issue a matter of class warfare, will certainly take advantage of this. The virus of communist ideology is more deeply implanted in this country than many of us realize.

Communism thrives on distrust, and its propagandists are clever and subtle. They will point out that rights of the laboring man have been infringed on, and that a "reactionary government, sponsored by big business," is trying to muzzle the voices of those individuals whom they tenderly refer to as "The Little People."

How much better it would be if the rank-and-file members themselves were allowed to clean up their own situation. The means were given them in other sections of the Taft-Hartley Law, which should go a long way toward democratizing unions.

Consider the Political Action Committee, for example. Its activities in the 1944 Presidential campaign were intensive, although I believe its influence was highly overrated. Many union members undoubtedly contributed money to its work which they would rather have kept in their pockets. Their resentment to this forced grab, I fancy, had much to do with the decline and fall of that organization in 1946.

On the other hand, if members are told that their union organization cannot endorse a candidate whom they wholeheartedly support, their anger might take an entirely different direction. I realize that they, as individuals, have the right to contribute to any political party they may desire. Nevertheless, I am inclined to doubt that the average union man will be convinced by Senator Taft's analogy of a company using stockholders' funds to back a political candidate as being similar to his union supporting one.

To begin with, he does not regard his union as a corporation. He considers it a fraternal body which protects his rights, and gives him collective security. Therefore, no argument, no matter how valid or factual, will make him think that the same laws which apply to companies in politics should apply to his union.

Where there is distrust there is naturally resentment. When labor is resentful, it is extremely difficult for genuine collective bargaining to exist, for this depends on cooperation. Enlightened management today is making every effort to break down the barrier that has been built up between it and its employees during the last few decades. Intelligent labor is meeting it half way. There are so many signs of sincere efforts to cooperate that I regret anything that might be used to impede this progress.

THE FOREMAN'S NEW STATUS

R. K. HEINEMAN, ASSISTANT PERSONNEL DIRECTOR
ALUMINUM COMPANY OF AMERICA, PITTSBURGH

If we may disregard a legal approach to the subject, it is proper to assume the attitude that the LMRA did not change the labor-law status of foremen; it prevents a change. Generally speaking, the unionization of foremen was not an objective of the original law. But because the law was not sufficiently specific, the process of drawing foremen unionization within its scope had, prior to the LMRA, reached an advanced stage through the medium of administration and interpretation. The new Act stops this process, and confines the scope of the labor law, in this respect, to its original subject matter—labor unions, not management unions.

The Act accomplishes this result by (1) including, in the definition of an employer, anyone acting as the employer's agent; (2) excluding, in the definition of an employee, a supervisor; (3) making a feasible definition of a supervisor to indicate that truly "management" people are contemplated; and (4) announcing that the industrial relations status of these supervisors is an individual matter, to be left alone by the law.

We should carefully note that the "supervisor" is now defined by the law. Job titles are not proper tests of whether a person is or is not a supervisor. If a person meets the requirements of the law as to management functions, he is a supervisor, regardless of his title.

The exclusion from the law does not forbid foremen's unions. The law expressly so states. But any such union need not be recognized, nor does the law extend any protection to the individual union members for activity in the interests of such union. So far as the law is concerned, an employer is free to decide whether he will or will not recognize and deal with a foremen's union, and is free to affect the employment status of any supervisor because of foremen union activity.

The problem of the future of foremen's unions now rests exactly where it belongs—in the lap of management, of which the foremen are a part. The new law removes all obstacles to the program of rejuvenating and revitalizing the industrial management team through education, training, and procedures for intelligent, cooperative effort. How well management—including the foremen themselves—meets this exacting challenge will determine the future of foremen's unions.

As an immediate result, supervisors and other management people should now be even more receptive than in the past to programs of management education and training which, it is generally recognized, are so essential to the future success and stability of our industrial system. The law now with certainty recognizes management as a career in which the element of individual free competition, as opposed to controlled mass movement, is economically essential and socially desirable, and to pursue which career the individual must, as he should, rely upon his own ability, fortified with a maximum of training and education.

WELFARE FUNDS

W. G. CAPLES, MANAGER OF INDUSTRIAL RELATIONS
INLAND STEEL COMPANY, CHICAGO

The new labor law leaves in doubt one of the points of controversy which arose under those vague and nebulous words of the Wagner Act, "other conditions of employment"—that of the legal compulsion upon an employer to bargain about insurance or welfare funds for the benefit of those of his employees who are union members. It is still problematical whether there is legal compulsion to bargain upon insurances or welfare funds, but there is now no doubt that if any employer *chooses* to bargain about these subjects, he is bound by definite legal restrictions. To ignore or circumvent these restrictions may subject him and the union, or either of them, to a criminal penalty of fine or imprisonment or both.

The legal fences about bargaining for welfare funds are erected by making it unlawful for an "employer to pay or deliver" and a union "to receive or accept, or to agree to receive or accept . . . any money or other thing of value" for welfare unless the money or thing of value is paid to a trust fund established for the sole and exclusive benefit of the employees of such employer, their families and dependents; or of such employees, families, and dependents jointly with the employees of other employers making similar payments. The trust fund to which payments can be made, has a limitation upon the use of funds and the persons who may serve as trustees. These limitations, *all* of which must

be met, are fully detailed in section 302(c) of the Act.

It appears that all moneys for these purposes allowed by law may be put in a general fund without definite allocation for specific purposes except for those moneys intended for pensions or annuities. The moneys intended for pensions and annuities must be placed in a separate trust and cannot be used for any other purpose. Another limitation would appear to be that non-occupational hazards which result in disability or sickness can be covered only through the purchase of insurance, and not through direct payment from the fund.

There will be many questions which arise in connection with established funds for welfare benefits, some of which have been in existence for a number of years and some of which are of recent origin, although the intent of the law appears to be to protect such funds. The law provides that where there is a contract in existence on June 23, 1947, providing for a welfare fund, the Act will not affect it until July 1, 1948, or the expiration of the contract, whichever is first. However, regardless of the term of any existing contract, if the fund was established prior to January 1, 1946, payments may continue to be made to the fund in the future even though a detailed basis for payment is not stated in a written agreement with the employer, the employer and employees are not equally represented in the administration of the fund, and the fund is not audited annually. Where welfare funds were in existence prior to January 1, 1947, and the fund provided for "pooled vacation benefits," contributions may continue to be made in the future to such fund for this purpose. The only change which appears necessary in funds established prior to January 1, 1946, is a duty upon the trustees of the fund to segregate and keep separate those funds which are for paying annuities and pensions and to see that such funds are used for no other purpose.

It is interesting to note that the law does not in any way affect company-sponsored plans where payment for such plans is made directly to an insurance company and not to a representative of the workers.

COMPANY-DOMINATED UNIONS

GLENN GARDINER, VICE-PRESIDENT
FORSTMANN WOOLEN COMPANY, PASSAIC, N. J.

In some quarters, a feeling exists that the LMRA may open the door to company-domination of unions. This contention is based on section 10(c), which states that the same regulations and rules of decision shall apply irrespective of whether or not the labor organization is affiliated with a national or international labor organization.

This proviso, in my estimation, merely accords the same protection to independent unions as to affiliated unions, such as the CIO and AFL.

The line between an independent union and a company-dominated union is finely drawn. But there are certain clear-cut tests which very distinctly indicate whether a union is "out of bounds." The Board, for example, has considered such factors as the following in determining whether a union is or is not company-dominated:

1. Do company officials or supervisors actively solicit on behalf of the labor organization?

2. Are benefits arising from group insurance plans, or similar benefits, given to those in a favored organization?

3. Is money advanced for dues in favored organization?

4. Is the union aided financially by the company?

5. Is one union favored over another in regard to discriminatory rules with respect to solicitation or other organizing activities?

6. Are company facilities, such as mimeograph and stenographic services, or bulletin boards, provided for use by the union?

So far as we can tell at the present time, there is nothing in the new law itself to indicate that these tests will be changed in any way. That is not to say, however, that *personnel* changes in the NLRB may not result in a revision of these tests.

On the other hand, an interesting development in respect to independent unions occurred just a few weeks before the LMRA was passed. The independent union involved represents the employees of a nationally known organization—Thompson Products, Inc.

Judge Allen, of the United States Circuit Court of Appeals, wrote the decision upholding the legality of the independent union at Tapco. He stated that a union is not company-dominated merely because it was formed quickly when the dominated union was disestablished, or because it received immediate recognition from the employer. Members of the disestablished union may organize at once, and are entitled to recognition by the employer, as soon as they can prove that a majority of the employees are members of the union. Even though the new union was formed by the attorney and an officer of the old one, the union is free of employer domination if it is shown that these men were acting in their own interests and not as agents of the employer.

In practice, company domination has usually applied only to independent unions. When affiliated unions received support from employers, the Board generally did not consider them to be company-dominated, in spite of such assistance.

Now we see the LMRA affirming, in principle, the Tapco decision, by stating that the same rules and regulations shall apply to independent unions as to affiliated unions.

If any company attempts to dominate a union, under our present

labor-relations legislation, it defeats its own purpose. It will only raise within its bosom an organization that sooner or later will be snapped up by strong independent leadership or by an affiliated union. The more it supports organization, the more desirable a target it becomes for unionization.

Now that the rules of the game for collective bargaining apply equally to unions and to employers, there is every advantage to seeking clear-cut, fair agreements, which can be equitably administered. If management and unions are both guided not by "who's right," but by "what's right," they will arrive at relations that are favorable to both, without domination on either side.

THE NEW LABOR RELATIONS BOARD

RALPH A. LIND, LABOR RELATIONS CONSULTANT
STEVENSON, JORDAN & HARRISON, INC., NEW YORK

The LMRA is declared to be "an Act to amend the National Labor Relations Act, to provide additional facilities for the mediation of labor disputes affecting commerce, to equalize legal responsibilities of labor organizations and employers, and for other purposes." How the Act is administered, and the results of its operation, will depend largely upon the attitude, policies, and procedures of the NLRB and upon the ability of the Board to fulfill the onerous responsibilities placed upon it. The attitude of labor unions and of employers generally toward the efforts of the Board to administer the law also will be a major factor in determining whether the Act will bring about the results intended by those who devised and supported it, or will prove to be unworkable.

The Board's task will be an extremely difficult one. It may have to conduct as many as 100,000 representation elections. It will have many thousands of cases to handle involving questions such as approval by the employers in a plant of union shop provisions, complaints concerning featherbedding practices, etc. The Board will have to decide many thousands of charges of unfair labor practices brought against employers and unions and their agents.

My personal belief is that there is little in the new law that is unworkable, provided there is determination and good faith in its administration, and provided not too many unions deliberately attempt to sabotage the law. There will, I am sure, be a considerable increase in labor-management disputes and in strikes for a year or more. If there are parts of the law which are unworkable administratively, or other defects are discovered, these things can be remedied by amendment without the need to repeal the Act.

The Act provides for a new NLRB composed of five members. The present three members of the Board remain in office, and the President has already appointed two additional members.

Functions of the Board

The provisions of the new law substantially increase the Board's functions and responsibilities, revise the previous procedures of the Board and carefully separate the Board's judicial functions from its duties to police and prosecute offenders. The members of the Board will act in the capacity of a quasi-judicial appelate court, and the general counsel will act in investigating charges and issuing and prosecuting complaints. This result is brought about mainly (a) by vesting in the general counsel investigation and prosecution of unfair labor practice charges, (b) by eliminating the review section, and (c) by making certain changes in the procedure and practices of the trial examining divisions.

The changes referred to in (c) above are mainly the following:

Transcripts of hearings and findings of trial examiners heretofore were analyzed and summarized by the Board's review section. As to cases which had no special features and did not involve novel questions, the memoranda prepared by the review section usually were relied upon. In too many cases, the draft opinion of the review section was adopted by the Board as its own final decision.

Section 4(a) of the new law prohibits this practice. It also prohibits the employment of attorneys "for the purpose of reviewing transcripts of hearings or preparing drafts of opinions, except that any attorney employed for assignment as a legal assistant to any Board member may for such Board member review such transcripts and prepare such drafts."

This section also states that the Board is not authorized to appoint persons "for the purpose of conciliation or mediation, or for economic analysis."

Past practices in the handling of trial examiners reports are prohibited, with the object of preventing any of the Board's staff either influencing or reviewing the trial examiners' reports in advance of publication. After the report and recommendation of the trial examiner have been served on the parties, without review by the Board, it becomes the final order of the Board if no exceptions are taken by either party within 20 days.

Additional responsibilities are given to the Board in sections 9 and 10; among them are the following:

1. To adjudicate jurisdictional disputes.

2. To seek injunctions against certain kinds of strikes and secondary boycotts. It may seek injunctions against any unfair labor

practice, whether committed by an employer or a union.

3. To determine when union dues are excessive.

4. To decide what constitutes "featherbedding."

5. To determine whether unions applying for certifications or filing charges of unfair labor practices have complied with the provisions of the Act requiring the filing of affidavits by their officers that they are not communists and do not desire to overthrow the government by unconstitutional means.

6. To conduct votes among employees for any of seven reasons (see "Employee Voting Procedures," page 84).

7. To give "priority over all other cases" to those involving jurisdictional strikes and secondary boycotts (see "Jurisdictional Disputes," August, page 88 and "Secondary Boycotts," September, 88).

8. To seek from a court a temporary restraining order or other appropriate relief, at the time it issues a complaint of unfair labor practice. This gives it power to act quickly where delay in reaching a final decision would prejudice proper enforcement of the Act.

As under the NLRA, the Board conducts representation proceedings, and proceedings to prevent unfair labor practices. However, under the new law, the general counsel has final authority to decide whether unfair labor practice charges shall be prosecuted by the issuance of a complaint in the name of the Board. The Board still controls the conduct of representation proceedings and decides unfair labor practice complaints that have been issued.

Rules of the Board

The Act makes it necessary for the Board to change many of its former rules and regulations. Among the important rules which will have to be changed are the following:

1. Rules governing who may file a petition for investigation of representation.

2. Rules of evidence in Board proceedings. Hearings "shall, as far as practicable, be conducted in accordance with the rules of evidence in the district courts of the United States, under the rules of civil procedure. . ." This is an important change in two respects—it may affect the conclusiveness of the Board's findings, and it will tend to protect the rights of both parties in a Board hearing as to the evidence they can submit and have considered. In receiving decisions of the Board, the courts are to treat the Board's findings as to questions of fact as conclusive "if supported by *substantial* evidence on the record considered as a whole." Heretofore there was no requirement that the evidence be "substantial."

3. Rules governing notice to and rights of non-affiliated unions.

4. Rules governing run-off elections (see page 84).

5. Rules governing the issuance of subpoenas. The Board's discretion in this matter is now limited.

6. Rules relating to recommendations of trial examiners.

The General Counsel

The authority of the general counsel will be great, almost too great. His term of office is four years. He is subject to the Board's control in a very limited way. He will exercise general supervision over all Board attorneys except local examiners and legal assistants assigned to Board members, and over regional offices.

Section 3(d) provides that "he shall have final authority, on behalf of the Board, in respect of the investigation of charges and issuance of complaints under section 10, and in respect of the prosecution of such complaints before the Board. . ."

By this provision, responsibility for what takes place in the Board's regional offices is centralized in one man who is ultimately responsible to the President and Congress. As a result of such control, his influence upon the actions of the regional staffs will be paramount to that of the Board members.

There is a possibility that conflicts in policy and procedures may develop between the general counsel and the Board. Such conflict is not unavoidable. It should not arise if the Board members as a whole and the general counsel conscientiously try to administer the law as Congress intended to have it administered. Under the Act, the Board is the rule making and deciding body, the general counsel is the investigator of complaints and the prosecutor. As he will have the power to affect the final decisions in dispute cases through his influence over the men who investigate complaints and prepare the evidence for prosecuting them, it is obvious that his conception of his responsibilities and of the Act's objectives is a matter of great importance, for he will have it in his power to establish for the Board a reputation of fairness and impartiality—*or the reverse.*

Employers' Responsibilities

The Board faces a terribly difficult task, and so do the unions. Employers have it in their power to make the Board's task less difficult by not creating conditions which will result in flooding the Board with dispute cases and petitions for elections. They also have it in their power to lessen the apprehensions of the labor unions about what the Act is going to do to them by not taking advantage of any provisions of the Act to be unfair to their employees or to their union representatives. There is urgent need for cooperation between management and labor to live under the law with a minimum of conflict, and there is urgent need that both management and labor refrain from doing anything which will complicate the problem of the Board and make it more difficult than it is.

As regards the Board's attitude, it would be reassuring to the country if the Board should now show an unmistakable intention to administer the new law honestly, fearlessly, and impartially. The present Board members should realize that it was public resentment against the results of the administration of the Wagner Act which caused Congress to curb its powers and prescribe for it large doses of impartiality.

It is to the interest of everyone in the United States that the sound objectives of the new labor law be realized.

CASES IN WORK SIMPLIFICATION

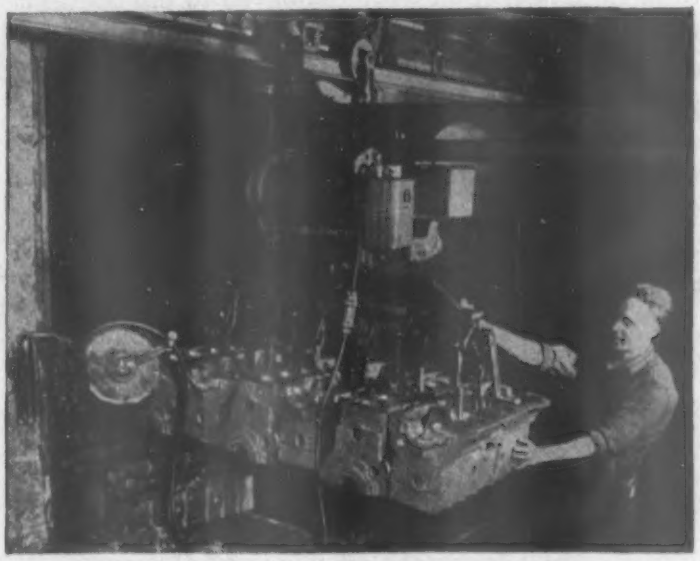
R. L. DUSTMAN • GENERAL SUPERINTENDENT, AND
D. R. BELL • ASSISTANT PLANT ENGINEER, CHEVROLET MOTOR DIVISION, GENERAL MOTORS CORPORATION, TONAWANDA, N. Y.

Increasing labor costs made all-out application of the principles of motion economy a *must* at the Chevrolet Motor Division plant in Tonawanda, N. Y.

Consequently, before the pre-war motor production line was reinstalled, the entire operation was carefully studied with a view to any possible changes that would permit operators to turn out more work with less physical effort. This initial study disclosed many needed improvements, which were put into effect just as soon as possible.

Following this first success, the studies were continued and expanded to cover additional operations. The more recent installations have produced equally satisfactory results.

On these pages are shown eight of the most readily photographed improvements at Tonawanda. Mechanically, they run the gamut from handling to machining; operations-wise, from receiving to shipping.



UNLOADING CYLINDER BLOCKS

Old Method. To unload the 160-lb. blocks, a portable roller conveyor was rolled into the car at the center. A two-man crew then lifted the blocks by hand onto the roller conveyor. Two additional men transferred them from the conveyor into skid boxes for movement to the machine.

New Method. Permanent hangers from which are suspended removal rails carrying a bridge and an electric hoist have been installed in company-leased cars. The rails permit the use of the hoist over the full length of the car. A special fixture for use with the hoist makes possible lifting of six blocks at a time, with one man to operate the hoist and another to align the hook in the blocks. The blocks then move down the conveyor by gravity to an unloading station. At this point, one of the unloading team tips or rolls the blocks onto a monorail conveyor, which takes them directly to the first operation.

Advantages. Increases unloading efficiency by 40 per cent. Reduces materially the physical exertion required of the employees and makes it unnecessary to hand-pick large, husky men for this job; almost any type of labor can be used.

COLLAPSIBLE STEEL RACK

Old Method. Bulky, lightweight material was unloaded from boxcars and stacked in nearby storage places by manual labor. It was later hand-loaded into skid boxes and moved to the assembly points by lift trucks.

New Method. Collapsible steel racks, with removable wheels, are pushed into the boxcars, and bulky material is piled directly on the racks by hand. Loaded racks are towed to storage areas by transport truck. It is possible to stack the racks three high by removing the wheels from those which are to be placed on the second and third tiers, and placing the slightly larger foot of the rack over the corner posts of the rack underneath. When material is required at the production line, the wheels are restored and the rack is towed to the point of use. Racks which are not in use are disassembled and can be stored in a small space.

Advantages. Increases available storage space by at least 100 per cent by better utilization. Reduces by 50 per cent labor required for handling. Reduces damage to material by eliminating much of the former manual handling.

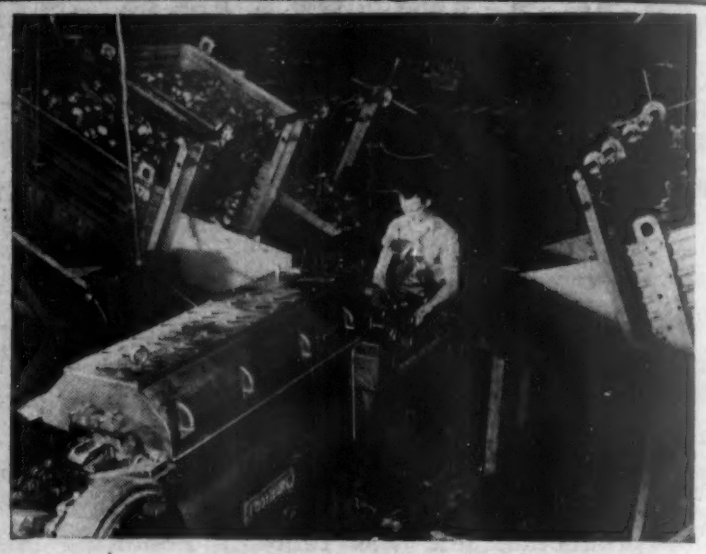
CONTINUED ON NEXT PAGE

CENTRIFUGAL CASTING OF BEARING METAL IN CONNECTING ROD

Old Method. Two men working as a team operated a pair of single-spindle spinners to perform the casting operation. One man dipped the rods into a tinning bath by hand and passed them to the spinner operator, who placed them in the spinner, poured the babbit by hand, and started the spinners operating.

New Method. Connecting rods, while still on an overhead conveyor, pass through a tinning bath and emerge as completely tinned rods. The operator removes the tinned rods and places them in a fixture on an 8-station revolving machine. As the machine indexes, the spinning rod passes an automatic babbitt pouring station and the bearing is cast centrifugally. As the machine completes the cycle the rod is delivered to the operator, who removes it and places it on the original conveyor, which takes the now-completed rod to the next operation.

Advantages. Increases production by 400 per cent. Reduces required work force by 50 per cent, for an over-all gain in the per-man-hour efficiency of the operation of 800 per cent.

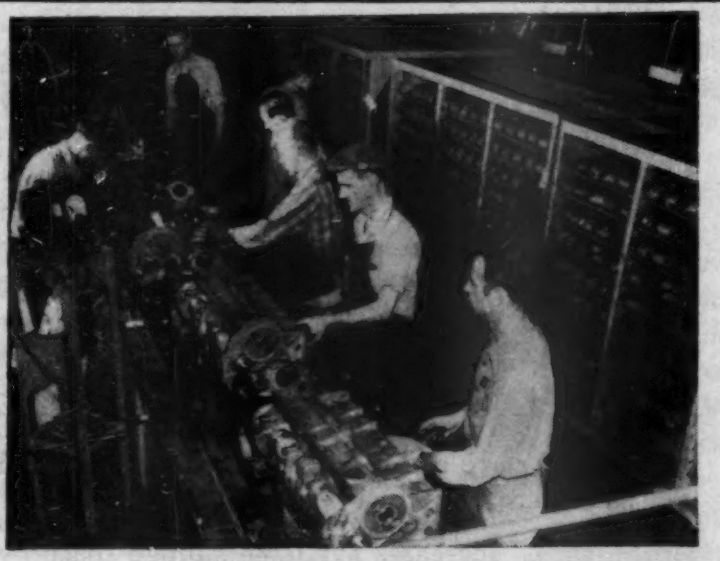


SKID BOX RACKS

Old Method. The four different parts required to be machined at the same time for a particular broaching operation were delivered to the operator in four separate skid boxes. These boxes were simply placed on the floor in a semicircular array about the operator's workplace. By carefully coordinated movement from box to box, the operator was able to assemble the parts and place them in the broach.

New Method. Parts are now supplied to the operator in skid boxes which have removable doors on one end. The lift truck delivery service places the boxes on sloping, raised platforms which are equipped with door removal devices. Then the doors are removed from the skid boxes, the parts fall out on to special stock trays, which are located on either side of the operator at convenient loading height.

Advantages. Increases efficiency of the operation by 40 per cent. Enables the operator to use both hands in performing his work. Reduces operator fatigue by eliminating the need for him to bend over four times in each cycle to pick up parts from each of the four skid boxes.



PISTON HANDLING

Old Method. Pistons were delivered by monorail conveyor to the assembly line, where they were unloaded into skid boxes. Separators between layers protected the highly finished surfaces and maintained matched sets of six. Skids were placed at point of assembly and pistons removed by operator as needed.

New Method. Pistons are delivered to assembly department by same conveyor described in old method. Specially designed piston-storage trucks are placed between the delivery conveyor and the assembly line. Each of these trucks contains three sections, each section contains ten shelves, and each shelf is further divided into five troughs, which slope downward from the back of the truck toward the point of assembly. Into each of these sloping troughs the unloader places one complete set of pistons. The pistons roll by gravity to the front of the truck where the assembly operator removes them and places them in the block.

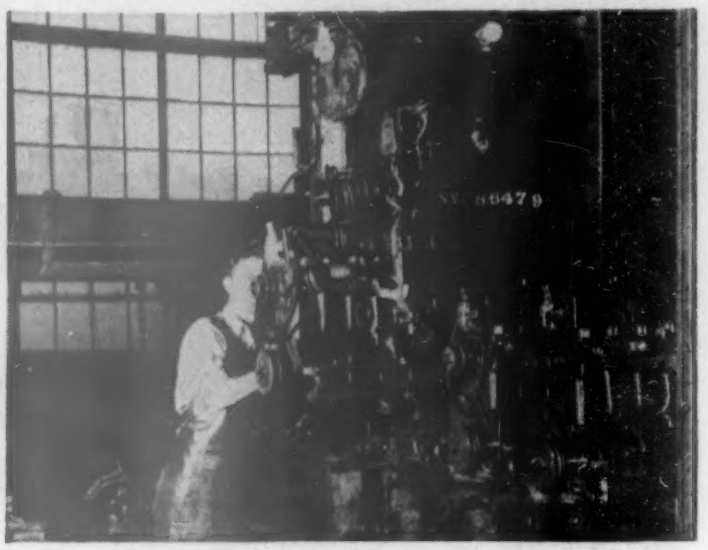
Advantages. Reduces parts damage. Saves 25 per cent of loading and unloading time.

CRANKSHAFT HANDLING

Old Method. Machines are equipped with three work stations and one loading station, each holding two crankshafts. Crankshafts are delivered to the machine by overhead conveyor. The operator formerly removed the 60-lb. crankshafts from the conveyor one at a time, and loaded them into the machine. Loading and unloading required four separate operations, each of which required physical exertion on the part of the worker involved.

New Method. Crankshafts are still received at the work station on the overhead conveyor. Instead of loading and unloading one at a time as before, an overhead hoist has been installed and a specially designed hook made. With this hook the operator can remove two crankshafts from the machine, place them on the conveyor, and, on the return trip, remove two other crankshafts from the conveyor and place them in the loading station ready for the operation.

Advantages. Increases production 62 per cent. Reduces worker fatigue so that physical stamina is no longer a requisite for the job.

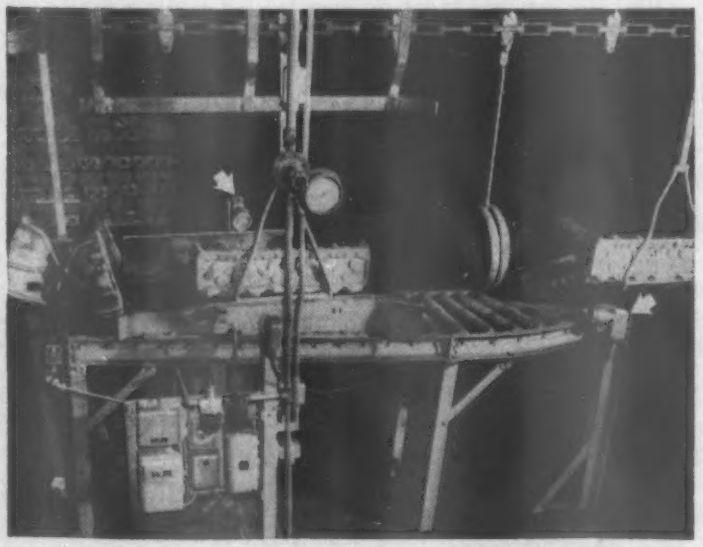


ENGINE SHIPPING RACKS

Old Method. A single I-beam rail and hoist with an extension beam, permanently located in the center of the car, was used to lift the engine from the conveyor into the car. A special, rectangular, welded steel frame was bolted to the bottom of the engine. The engine was then placed on a greased rack and pushed by hand to the furthermost position from the center of the car. Here special clamps held the motor in position.

New Method. A new permanent framework was designed and installed in the boxcars to incorporate the function performed by the rectangular steel frame. This eliminated the operation of attaching the frame. In addition, permanent rails carrying a telescoping bridge and electric hoist were installed in each car. This permitted the hoist to cover the entire area of the car, thus eliminating the manual pushing of 530-lb. engines into position.

Advantages. Increases loading efficiency of two-man crews 33 per cent. Eliminates the need for one man to attach steel frames at loading point. Similar savings are also made at the assembly plant.



AUTOMATIC HEAD UNLOADING

Old Method. Heads were piled in skid boxes placed in boxcars, and the loaded skids delivered to the broach operator by lift truck. Operator then unloaded each 75-lb. head manually and placed it in the broach loading fixture.

New Method. A monorail conveyor has been installed along the material receiving dock, with loading stations located at the car spots. The rough heads are manually loaded onto the conveyor which transports them to the machine floor. As the heads pass over the unloading stations, one at each broach, they are removed by a mechanical unloading device controlled by an electric eye. The head is delivered by gravity roller conveyor to the work station, where it is loaded into the broach. A second electric eye is directed across the conveyor about 1½ inches above the rollers. When the conveyor is filled, the beam is interrupted so that no more heads are deposited until the section has been cleared.

Advantages. Increases production on the broaches by 10 per cent. Saves 50 per cent in handling of skids in materials department. Reduces operator fatigue.

AUXILIARY SUPPLY TANK of a mechanical force-feed oiling system is equipped with internal float-switch mechanism which automatically disconnects motor when oil level is low. Only way to restart the machine is by refilling the oil tank to the proper level

BETTER LUBRICATION AT TWO-THIRDS THE OLD COST

F. B. BAHNSEN • CHIEF MECHANICAL ENGINEER, VICTOR MANUFACTURING & GASKET COMPANY, CHICAGO

Restudy of plant lubrication practices in the light of latest methods and equipment can prove to be a bonanza both to maintenance and to production engineers. Recent experience of the Victor Manufacturing & Gasket Company of Chicago in reshaping its lubrication program is a good case in point.

For explanation, let's look first at the nuggets Victor came up with in its search for money-saving improvements. Cost of lubrication has been reduced one-third for labor and about the same for materials. Machine breakdowns from improper lubrication are now practically unknown. Life of all machinery and equipment has been appreciably lengthened. Maintenance costs have been reduced accordingly.

These commendable goals are the avowed intents, with varying results, of any sound plant lubrication program, and they always were at

VICTOR MFG. & GASKET CO. **VICTOR MACHINE NO.** 1912

THIS MACHINE REQUIRES REGULAR LUBRICATION

CHECK ALL OIL AND GREASE FITTINGS AND LUBRICATE PER FOLLOWING SCHEDULE

			NUMBER OF LOCATIONS ON THIS MACHINE
◇ YELLOW	GREASE NO. 1	GREASE DAILY	5
◇ BLUE	GREASE NO. 2	GREASE WEEKLY	6
◇ RED	GREASE NO. 2	GREASE MONTHLY	—
○ YELLOW	OIL NO. 1	OIL DAILY	1
○ BLUE	OIL NO. 2	OIL WEEKLY	—
○ RED	OIL NO. 3	OIL MONTHLY	4
△ YELLOW	STOCK LUBRICANT NO. 1	CHECK DAILY	1
△ BLUE	STOCK LUBRICANT NO. 2	CHECK DAILY	—
△ RED	GEAR COMPOUND NO. 1	CHECK WEEKLY	2

REQUEST LUBRICANTS BY THESE NUMBERS FROM COMMERCIAL LABORATORY

THE APPEARANCE OF THIS MACHINE REFLECTS THE ABILITY OF THE OPERATOR. KEEP IT CLEAN AND TAKE CARE OF PROPER LUBRICATION

A LUBRICATION CHART is attached to each production machine to instruct the operator, who is held responsible for doing the scheduled "hand" lubrication not practical to handle by mechanical systems

MONTHLY GENERAL MAINTENANCE FOR ELECTRICAL MOTORS

MARCH – 1947

MACHINE	OIL		GREASE		LOCATION	
Large rubber mill	★	✓			Dept. K-9	1
Small rubber mill	★	✓			Dept. A-4	2
Generator set	★	✓	★	✓	Large surface grinder— A-3	3
Generator set	★	✓			Small surface grinder — A-3	4
Vent fan	★	✓			Roof over rule die dept. — A-3	5
Vent fan			★	✓	Roof over rubber mill room — A-4	6
Vent fan			★	✓	Roof over rubber mill room — A-4	7
Vent fan intake			★	✓	Roof over superintendent's office	8
Vent fan	★	✓			Roof over oven #4 — A-15	9
Vent fan			★	✓	Darkroom — boiler room #1	10
Vent fan			★	✓	Dynamometer room window	11
Lineshaft motor	★	✓			Dept. A-9	12

PROPER LUBRICATION of all electrical equipment is a responsibility of the electrical maintenance staff, and is guided by a series of monthly schedules which must be checkmarked as the items are completed

Victor. The degree of their attainment, however, was limited by the old "squirt-beat" methods, and reached this height only when the following major improvements were recently put into operation:

1. Wherever possible, mechanical and automatic methods of lubrication were substituted for the skill and efforts of trained lubrication workers. This change involved about three-quarters of all production machinery.

2. Where installation of "mechanized" lubrication was impractical or impossible, such as on motors, lineshafts, single-spindle drill presses, and the like, schedules as to types of lubricant and frequencies were set up to eliminate improper or inadequate lubrication service. In addition, types of lubricants were standardized.

Installation of mechanized lubrication was designed to eliminate the imperfections flowing from dependence on manual attention. There are well over 500 machines at Victor, of many types and sizes, which in many cases require specialized knowledge to lubricate them properly. Despite the existence of an organization of skilled lubrication men who were responsible for these machines, expensive downtime and repairs caused by improper lubrication showed a lack of effectiveness. Also, because some of the machines could not be stopped for safe lubrication, they had to be serviced at weekends at premium labor rates.

Chief method for eliminating these conditions was the widespread application of mechanical force-feed oiling systems and of centralized single-shot greasing systems wherever feasible. Force-feed oiling systems were designed both for lubrication of machines and of coil-stock feeding operations, of which there are many.

An important feature of the new force-feed oiling systems was the addition of auxiliary supply tanks to eliminate the need for frequent refilling. These tanks were designed with internal float-switch mechanisms connected to the starter coils of the machine motors. When the oil in any tank drops to an unsafe level, the mechanism automatically disconnects the motor. Because the mechanism is locked, it cannot be tampered with by the machine operator or lubrication workers, and the only way to restart the machine is by refilling the oil tank to the proper level.

In the few instances where mechanized lubrication was not feasible, the current methods of "hand" lubrication were refined to eliminate the hit-or-miss tendencies of the old system. Primarily, responsibility for manual lubrication was newly divided among the lubrication workers, machine operators, and electrical maintenance men, depending upon the type of equipment to be serviced.

For the guidance of all these groups a marker system was adopted to insure proper lubrication of all points on any machine not mechanically lubricated. Each point now bears a small metal plate which shows by its shape and color the type and frequency of lubrication. These plates are attached, for example, to oil cups, fill caps, grease cups and fillings, and sight-feed oilers. In addition, all machines carry a chart which summarizes the number and types of lubrication points on each machine, and specifies the frequency required. It also instructs the operator to check the lubrication schedule, and reminds him to keep the machine clean.

Individual Responsibility

Machine operators are responsible only for their own machines. Whenever multi-shifts are scheduled, this arrangement insures lubrication of production machinery in direct ratio to its usage. Punch presses and similar equipment, however, are serviced by the lubrication workers, who also are responsible for lubrication of auxiliary and service equipment, and mechanical power transmission machinery.

Lubrication workers have been placed under the supervision of the safety department. This unique action was decided upon to enable these men to make safety inspections of production and other equipment while performing their lubrication duties. By this combination of duties the workers profit from better exercise of safety precautions, and the safety department benefits from the reports of full-time experienced inspectors.

Because of its special nature and requirements, electrical equipment is lubricated by electrical maintenance men. This is done in the normal course of their duties of keeping all electrical equipment in good operating order. But even here specific schedules have been devised to make sure none of this equipment will be overlooked. These schedules include motors on production machines, fans, unit heaters, pumps, blowers, and compressors. They are issued monthly, and show in columnar form the location of each item, and whether to oil or grease. They also provide for checkmarks to indicate the work has been done.

Inspection Only

Other than for electrical equipment as just described, the maintenance department performs no actual lubrication work. It does check encased gear reduction units and it makes periodic and thorough inspection of each production machine. Whenever a need for lubrication is observed, it is called to the attention of the proper servicing group through the medium of the production foreman. In the final analysis, he is the one who is responsible for proper operation of his equipment, and therefore who must supervise its care and lubrication, and call for repairs when needed.

One notable benefit of the improved plant lubrication program has been the attainment of a much better job with less highly skilled workers. Mechanical regularity has largely replaced fallible human skill. Lubrication men now spend most of their time as "checkers" to make sure the mechanical systems are functioning properly. Incidental to this, the higher investment in mechanized lubrication is somewhat offset by the reduced requirements for lubricating service equipment. Almost needless to say, all new machinery purchased or built hereafter at Victor will be equipped wherever possible with mechanized lubrication.

EFFECTIVE ACCIDENT STOPPERS are made from photographs of what could happen. Posed pictures are used by Ryan as one of the ways to give the worker education in safety

EDUCATING WORKERS IN SAFETY REDUCES LOST-TIME ACCIDENTS

MAURICE M. CLANCY • SAFETY ENGINEER, RYAN AERONAUTICAL COMPANY, SAN DIEGO

No one likes to be injured, but when all the contributing causes of industrial accidents are analyzed, the blame can almost always be attributed to some individual who is not performing his job correctly. It may be the bandsaw operator who looked away from his immediate task, or the maintenance man who failed to inspect the valves on a sandblaster, or even the safety engineer who has not done an adequate job in providing a program that detects potential accidents before they happen. In each case it is the man, not the machine, who is at fault.

In other words, it is the worker who is primarily responsible for safe operation of machines in any plant. It was with this thought in mind that Ryan inaugurated its safety program—a program that has cut its accident frequency rate approximately 67 per cent.

As a starter, four safety committees were formed—workmen's inspection committee, supervisors' safety committee, executive safety committee, foremen's and leadmen's safety committee. The first three devote their time to detecting, evaluating, and eliminating safety hazards at different levels of supervision. The fourth functions as an educational unit to maintain safety consciousness among the employees in the plant.

Suggestion and recommendations for safer procedures originate with the workers, through these committees, rather than with the safety engineer or top management personnel. Thus the employee feels that

"LOOK where you're going." Ryan stresses safe operation of plant transportation equipment. A small truck can do just as good a job of running a man down as a big one can. Pictures like this in the plant magazine and on bulletin boards keep the safety message fresh in workers' minds

he is making the decisions that affect his welfare.

All the committees function along democratic lines. The majority prevails and the safety engineer is not accorded extra consideration in the voting on any question. Whether a suggestion is important enough to warrant referral to a higher committee is left up to the discretion of the group. Otherwise it is rejected, or accepted and put into work, at the level on which it is received.

Workmen's safety committee. This is a rotating committee, formed each week. The safety engineer selects three employees from the seniority list. A meeting is held each Friday morning. The chosen members of the committee discuss the procedure to be followed, and hear a short talk on safety by the safety engineer. Each member gets an identifying badge, and the group makes a complete inspection tour of the plant, taking about two hours.

On the tour each member of the committee makes notes of all the hazards he notices. Also these men talk to workers, and try to get their suggestions. Ryan has found that employees are far more likely to tell what's on their mind to fellow-workers than they are to talk to supervisors or top management.

At the conclusion of the tour, the men discuss their own observations and review the suggestions they have collected from workers. Suggestions involving safety are considered, and either rejected, or approved and passed on the plant engineer for installation, or referred to the supervisor's safety committee because they involve sizable expenditures, or policy changes. It often happens that excellent suggestions for procedure changes not involving safety are picked up by this committee. These ideas are passed on to the proper plant authorities by the safety engineer.

After the workmen's inspection committee has written a report, it is dismissed until the last Friday of the month, when all the committees that have served during the month are called together to be told what has been done with their recommendations. At this time they are also shown an educational safety film.

Supervisors' safety committee. This group is composed of five members—the plant superintendent, three division superintendents (plant engineering, materials, and tooling), and the safety engineer. These men meet during the last week of each month to act on the suggestions referred to them by the four weekly inspection groups. They take one of three possible courses of action with each suggestion: (1) Reject it; (2) approve it; (3) refer it to the executive safety committee.

Executive safety committee. The final decision in matters of major safety improvements is made by the executive safety committee. This group is made up of the secretary of the corporation, the works manager, the chief inspector, and the safety engineer. These men either reject or approve a suggestion.

Foremen's and leadmen's safety committee. Unlike the other three committees, the function of this group is purely educational. The objective is to bring safety messages to the employees and promote safety throughout the plant. Once every two weeks the foremen call their leadmen together for an informal discussion and for special safety messages. A report of any suggestions produced at these meetings is sent to the safety engineer.

Credit for most of the improvement in the safety record is given by Ryan management to the functioning of these committees. They are depended upon to discover and correct hazardous conditions that can be found only by the man on the job. But there are other special activities that help.

The plant is divided into two divisions—direct production employees and indirect employees. A monthly safety contest is conducted within each group. Each department in each group is charged with time lost on account of injury on a uniform basis—so much time for each type of injury. Awards in the form of conspicuous signs are presented to the two winning departments each month.

Also a housekeeping award is made each month to the department displaying the neatest and most orderly appearance. Charts of the relative standings of all departments are sent to the foremen and are placed on departmental bulletin boards. In the first 18 months that this contest was run, the percentage of man-hours lost was cut to less than half.

HORSEPLAY is out of order in an industrial plant. It is dangerous for all who participate in it. Caption to this picture reads, "You may 'feel like a million,' but don't show it this way, or that happy condition may be strictly temporary"

Eyes of all employees are checked to determine whether or not they need glasses. The machine used for the examination measures depth perception and muscular balance, and the readings, interpreted by an opthamologist, indicate when correction is necessary. Ryan helps its employees buy their glasses at a reduced cost, if they have them made up in safety glass. The sight tests also help place workers where the work they do is best fitted for them, and therefore safest.

Another effective means of encouraging safety-consciousness in employees is the practice of taking photographs of unsafe practices and displaying them in the plant magazine and on bulletin boards.

Safer working conditions have been provided by repainting the plant. Interior walls are now light green and the ceiling has been given a flat white finish to produce a lighter working area. Machines are painted medium green, with a light buff color on the moving parts. The over-all effect of this painting program has been to help the worker see his work, and to give him a psychological "lift" that has lessened fatigue and been reflected in better production.

All accidents are closely investigated and analyzed to guide management in preventive measures. And a first aid department is ready to go into action in all cases of real or suspected injury.

Too much emphasis cannot be placed on the orthodox methods of taking care of accidents after they occur. But even more important are the methods and program that work toward promoting the consciousness of the need for safety in the minds of workers, and thereby making it impossible for the industrial accident to find a place to happen.

"DON'T BE A BLIND DATE." A poster, posed by Ryan, dramatizing the need for eye protection in the plant has been distributed nationally

DEPT. SERIES NO.	ALLOWED DOLLARS PER MACHINE-HOUR ACCOUNT No. 801	ACCOUNT No. 803	MACHINE-HOUR FORECAST	BUDGETED DOLLARS PER MONTH ACCOUNT No. 801	ACCOUNT No. 803	TOTAL
501	0.00300	—	60,000	180	—	180
502	0.22400	0.02783	30,000	6,720	835	7,555
508	0.09625	0.05000	6,000	575	300	875
509	0.08800	0.03360	10,000	880	336	1,216
510	0.08625	0.04950	4,000	345	198	543
512	0.09200	0.05380	5,000	460	269	729
513	0.27400	0.03360	5,000	1,370	168	1,538
			TOTALS	10,530	2,106	12,636

FIGURE 1 — Maintenance budget—light metals manufacturing division

MAINTENANCE BUDGET MATCHES MANPOWER AND WORK LOAD

PHILLIP H. BURKONS • PLANT INDUSTRIAL ENGINEER, PLANT ENGINEERING DEPARTMENT, THOMPSON PRODUCTS, INC., CLEVELAND

Cost of maintenance of all production machinery and auxiliary equipment at the Cleveland plants of Thompson Products, Inc., has been reduced 35 per cent by a budgeting program which features a maintenance manpower budget.

This budget, evolved from anticipated machine-hours of manufacturing operations, keeps a constant balance between maintenance manpower carried on the payroll and actual machine maintenance requirements. It is based on the fact that machine maintenance requirements, have a proportionate relationship to production machine-hours. In other words, for any specific number of hours that pro-

PLANT DIVISIONS	SERIES	BUDGETED DOLLARS PER MONTH ACCOUNT No. 801	ACCOUNT No. 803	TOTAL
ACCESSORIES AND PARTS	300	11,934	17,550	29,484
VALVE AND JET	400	105,300	4,212	109,512
LIGHT METALS	500	10,530	2,106	12,636
PISTON RINGS	600	702	702	1,404
PLANT ENGINEERING	700	4,212	702	4,914
	TOTALS	132,678	25,272	157,950

FIGURE 2—Plant maintenance budget

duction equipment is in operation, there are proportionate man-hour requirements for lubrication, machine adjustments, preventive maintenance, major overhaul, and even urgent labor jobs of various types.

These man-hour requirements are not difficult to determine. In general, they are developed from past experience, using accounting records of all maintenance expenditures as a guide, supplemented by engineering analysis of the service components involved. Because this company operates as four separate manufacturing divisions, for which plant services are provided by the one plant engineering division, maintenance man-hour requirements are the sum of the requirements of each of the five divisions. These in turn are the sum of the requirements of every department comprising each division.

There are four major steps involved in the development of the maintenance manpower budget:

1. Each manufacturing division (also maintenance division), on the basis of its past experience adjusted for improvements in maintenance techniques and in life of materials, ascertains its own maintenance costs in "dollars per machine-hour." These costs are established departmentally, and are calculated on an annual basis for two maintenance accounts: General maintenance (No. 801), and instrument maintenance (No. 803).

2. In the middle of each month each manufacturing division forecasts the standard machine-hours of operation expected for the coming month for all its departments, from the production schedules. From these forecasts are estimated both general and instrument maintenance costs for each department, which are added together to secure, first, the divisional totals, and finally a plant total. This total constitutes a monthly maintenance cost budget for the entire plant.

3. Given the total cost budget and divisional breakdowns, the maintenance department interprets them into labor-hour requirements for the coming month.

4. These labor-hour requirements are finally translated by the maintenance department into next month's manpower requirements for machine and equipment maintenance of the entire plant.

The actual methods of calculation as just outlined are demonstrated progressively in the four exhibits shown above (on opposite page) and below. In these exhibits hypothetical figures have been used but there is no distortion of the principles involved. Because the exhibits are condensed to show only the major steps, the bases for the calculations need to be enlarged upon as follows:

Maintenance costs per machine-hour. In the calculation of the "allowed dollars per machine-hour" (Figure 1), consideration is given to these maintenance cost factors:

1. Routine maintenance, such as lubrication, equipment inspection, and cleaning of machine ventilating mechanisms.

2. Approximate frequency of major overhauls required by each type of equipment, and their cost.

3. Amount of materials and parts, based on average of previous experience, that will be needed for maintenance and repair of machinery and equipment.

4. Maintenance anticipated on new equipment not yet received, but either on order or a contemplated purchase.

5. Minor changes in machine layout or rewiring.

6. Maintenance department's overhead, using a composite department rate per maintenance labor-hour as furnished by the maintenance department.

7. Improvements in maintenance techniques and materials.

Divisional maintenance budget. The "machine-hour forecast" (Figure 1) is obtained by multiplying the quantity of the expected "sales" of the product of any division for the coming month by the standard hours specified on the production routing sheets for these products. In practice, the departmental production schedules for new products

BUDGET LABOR-DOLLARS PER MONTH		BUDGET LABOR-HOURS PER MONTH		
ACCOUNT No. 801	ACCOUNT No. 803	ACCOUNT No. 801	ACCOUNT No. 803	TOTAL
5,967	8,775	3,978	5,850	9,828
52,650	2,106	35,100	1,404	36,504
5,265	1,053	3,510	702	4,212
351	351	234	234	468
2,106	351	1,404	234	1,638
66,339	12,636	44,226	8,424	52,650

FIGURE 3—Maintenance labor-hours budget

MANPOWER ALLOWANCE		
ACCOUNT No. 801	ACCOUNT No. 803	TOTAL MEN REQUIRED
19.9	29.3	49.2
175.5	7.0	182.5
17.6	3.5	21.1
1.2	1.2	2.4
7.0	1.2	8.2
221.2	42.2	263.4

FIGURE 4—Maintenance manpower requirements

or work in process serve as the basis for calculations.

The "allowed dollars per machine-hour" for each maintenance account number, multiplied by the "machine-hour forecast," gives the "budgeted dollars per month" for each department. The sum of these budgets is the budget of the division.

Plant maintenance budget. The plant maintenance budget (Figure 2) is the summation of the divisional budgets, by account numbers. It represents (1) the amount of money each division sets aside in its operating budget for maintenance services, and (2) authorization to the maintenance department to maintain the amount of labor needed for the fulfillment of these services.

Maintenance labor-hours budget. Translation of the plant maintenance budget into the number of maintenance labor-hours (Figure 3) required for fulfillment involves the elimination of the cost of materials and overhead which had to be included originally so as to obtain the correct over-all figures. The result is "budget labor-dollars per month." In the exhibit a straight one-half deduction has been made, for simplicity, but in practice this deduction varies for each department, and hence for each division. Moreover, this deduction actually is not on a pro-rata basis, but is the sum of the various departmental estimates of these factors previously included in the calculation of "allowed dollars per machine-hour."

After subtraction of the estimated cost of materials and overhead, labor-dollars are reduced directly to labor-hours by using an average labor cost, in this case a hypothetical $1.50 per hour.

Maintenance manpower requirements. Fundamentally, the "manpower allowance" (Figure 4) is obtained by dividing the total labor-hours by the number of regular working hours per month. A hypothetical figure of 200 hours has been used in the exhibit.

The resultant total figure represents the manpower which the maintenance division is allowed to maintain in its force, since the amounts designated in the division budgets are, in a sense, its only source of income.

The exact number of electricians, carpenters, millwrights, and other crafts which form the basic labor requirements of the division are calculated by the maintenance department. This is done on the basis of its past experience in the percentages of each type of work that will be required to maintain the machinery and equipment of each division. The number of men required for building maintenance is also calculated by the maintenance department, on the basis of a fixed annual forecast.

This is not to say that the maintenance department is kept staffed at all times to the full extent of its budget. Seasonal work, such as repairs to boilers, outside painting, and cleaning ventilators, requires the hiring of additional men. The budgeted hours for such work, however, are accumulated for the time when they are required.

Men Seldom Laid Off

Actually, once the program was put into effect, most of the fluctuations in manpower requirements from month to month have been small and do not involve large-scale layoffs. In the few cases that have required retrenchment, men were transferred to manufacturing divisions on a temporary loan basis.

Obviously, the success of the manpower budget program is centered in the control it affords toward adherence to its objectives. From the standpoint of over-all cost control the budget is more rigidly maintained than ever before because two major forces are constantly opposing each other to keep it in line.

In the first place, each manufacturing division is forced to analyze each maintenance requisition emanating from its departments from the viewpoints of (1) the necessity for the maintenance and (2) its effect on the total spent to date against its budget. Many jobs which in other times would have been passed on to the maintenance division have been found to be unnecessary aids to those in manufacturing divisions who are really responsible for them. For example, it has come to light that die setters were obtaining temporary assistance from the maintenance department in the setting of difficult dies, a function for which the die setters were wholly responsible and one that was completely outside maintenance department operations. And, if the total spent to date by any division is greater than the bogey set for maintenance costs by that date, that division knows it will either be forced to discontinue its maintenance before the end of the period, or it will have to ask for and justify an increase in its budget.

Budget Strictly Followed

The second major controlling force is the knowledge by the maintenance division that it retains its personnel on the basis of the projected estimated requirements for the month for each manufacturing division, and therefore must serve those divisions in a share equal to their budgeted requirements. Therefore, the maintenance department keeps track of the labor-hours required for each division to make certain that the budgets are not being exceeded.

From the foregoing it must not be assumed that the budgeting of maintenance requirements is completely inflexible. If any manufacturing division enjoys a greater production than was anticipated, the maintenance budget is automatically increased in proportion to the increased machine-hours.

On the other hand, to obtain an increase in the budget either because of miscalculations of the original budget or because budgets have been inadvertently exceeded is hard indeed. When a division finds that its maintenance budget is in danger of running out before the end of the stipulated period, and this without any justifiable increase in machine-hours consumed, it is required to prepare a formal request for a budget increase which must be submitted to the chief industrial engineer with all the supporting evidence for its justification. The time consumed in preparing the evidence, and in answering the questions of the investigation sure to follow, make it far easier for a manufacturing division to take precautions to live within its budget.

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BETTER VISION

FOR GREATER EFFICIENCY

EDMUND F. RICHARDSON, PRESIDENT, AMERICAN OPTOMETRIC ASSOCIATION

THE DRAFTSMAN (left) needs proper vision from 10 to 14 inches for the near side of his board, 30 for the far side. In the die room (right) a machinist working from a diagram should be able to make quick eye adjustments

WHAT MAKES A GOOD VISION PROGRAM

More than half the employees in the typical industrial plant have visual inefficiencies that handicap them in job performance. Less than half of them have had their inefficiencies corrected.

A scientific vision program, based on well-tested principles, can overcome 95 per cent of all visual handicaps.

Matching workers to jobs, visually, and correcting

POURING MOLTEN METAL (left) may not require any special visual efficiency, but it does need protection from glare. Lathe work (right) can be exacting. In most instances proper glasses can help the worker do the work he wants to do

SOLDERING small parts (left) calls for good near-point vision, and inspection (right) means great eye activity and often needs color discrimination. It is important, therefore, to be sure the employee's vision is adequate for the job

correctable inefficiencies can increase production as much as 25 per cent, War Production Board surveys showed. A study of reasons for spoiled work revealed that inefficient vision accounts for 37 per cent.

In one company it was found that employees who had the benefit of visual correction averaged $7 a month greater earnings on piecework jobs than their fellow-workers. Management estimated that it earned an extra 5 per cent dividend on the capital equipment used by the employees with good vision.

The relation of vision to safety is better recognized than its relation to production and efficiency, but here, too, there frequently is neglect in applying well-known principles.

An employee with inefficient vision is dangerous not only to himself but to his fellow-workers as well. Vision is doubly important in a safety program because inefficient vision can cause accidents, and eye injuries are among the most common serious industrial accidents. Every 8-hour day a thousand workers suffer eye injuries. Safety authorities estimate that 98 per cent of them could be avoided.

In accident compensation alone eye injuries cost industry about $20,000,000 a year. In compensation claim cases in many states a record of the employee's vision prior to the accident may be important evidence. Such a record is a byproduct of a vision program.

Under today's contracts with labor unions it becomes increasingly difficult to discharge workers once they are hired. Consequently pre-employment testing of all important factors, including vision, is more important than ever before.

The benefits of a vision program are obvious, once attention is directed to the subject, yet only one company in seven makes anything like an adequate attempt to deal with the problem of inefficient vision. The major benefits are that it can boost production, reduce waste, and lower the accident rate.

There are wide variations in visual requirements of industrial jobs. The employee who uses a micrometer or who assembles small parts, as in watchmaking, must have average or superior "near-point" vision A crane operator or signal man must have good vision at a distance. The truck driver must have a wide field of vision so that he sees not only straight ahead but also to the sides, and he must have a good sense of space relationships if he is to avoid accidents. Color perception is essential to the color printer, or to the assembler of electrical products in which wires of different colors are used.

Matching Workers and Jobs

Since there are also marked individual differences in the various visual capacities of employees, an important part of a vision program is to match employees to jobs. This usually involves job changes for only a small percentage of employees, because, so far as vision is concerned, most employees can do the work they desire by having inefficiencies corrected. It is important to the employee as well as to the employer to find out if a job overtaxes visual capacity.

The principal visual problem in modern industry is inefficient near-point vision—ability to see properly at 10 to 20 inches. The average person needs the help of glasses to see properly at close range shortly after he reaches 40. Many need help earlier but may not realize it until tested.

CONTINUED ON NEXT PAGE

VISUAL ANALYSIS

Inasmuch as a good occupational vision program deals with many visual capacities, the common Snellen letter chart test of vision is far from adequate. This reveals only what one sees at a given distance—20/20 vision by the Snellen test is average acuity at 20 feet and beyond. This gives little indication of one's visual capacity for a particular job.

Following are the principal visual capacities of employees and applicants which should be analyzed in a good industrial vision program:

Distant fixation—ability to observe and interpret with each eye, and both eyes, an object at a distance of 20 feet or more.

Near-point fixation—the same as above, for a distance of 14 to 20 inches.

Depth perception—ability to judge relative distances, or to perceive depth, which requires good coordination of the two eyes.

Field of vision—ability to see an area up and down and to the right and left while fixating a target.

Color discrimination—ability to distinguish colors.

The importance of the services of a vision specialist should be recognized in embarking on a vision program involving comprehensive tests and correction. The optometrist is such a specialist. He makes a complete visual analysis and prescribes and adapts ophthalmic aids, or administers visual training where necessary. He is trained to search out and identify disease of the eyes, and when present he refers the patient for other professional care. Ophthalmologists and oculists are physicians specializing in pathology and surgery of the eyes.

Professional service may be obtained by employing professional personnel as a part of the staff and providing it with adequate facilities, or by engaging the services of an outside practitioner.

As aids to testing large numbers of employees or applicants on the major visual capacities important in occupational vision, optical manufacturers have developed testing instruments. They are used to screen out easily and quickly those who need further attention. More comprehensive tests are then made for those who do not pass the screening tests, and visual correction is prescribed.

In any cross-sectional group, visual inefficiencies are found to rise rather sharply at about the 40-year age point. At 30, about 39 per cent are found to have visual inefficiencies requiring correction; at 40, the figure is 43 per cent; at 50, it is 71 per cent; at 60, it is 82 per cent; and in a group over 60, about 95 per cent are likely to need correction.

However, this does not mean that visual analysis of younger employees is less important. On the contrary, the younger person is less likely to suspect that he has a visual problem, and, if he has one, he unconsciously seeks to compensate for it. This may result in unnecessary damage to vision and also lead to other disorders. One employee with an uncorrected visual problem may lower the morale of a whole plant. He is likely

TESTING FOR VISION

SCREENING employees for quick classification is aided by equipment developed by the optical industry

COLOR DISCRIMINATION, near- and far-point vision, and coordination are among the visual skills tested by these instruments

DISTANCE from work point to eye is measured on the job (left). Right, detailed eye examinations are conducted by a vision specialist for those who are unable to pass the screening tests. It is he who prescribes corrective lenses

to find it difficult to keep up with his fellow-workers in quantity and quality of production. He becomes disgruntled, finds fault with others, and may become a "trouble-maker."

It should be emphasized that the purpose of the vision program is not to screen out employees, but to discover inefficiencies and correct them, and to match employees and jobs.

JOB ANALYSIS

To match employees to the jobs which they are most visually capable of performing, there must be analysis of the visual requirements of each job. This means determination, by one of adequate judgment, of the various capacities which an employee should have to do the job properly.

Is distant vision essential? Is near-point vision essential? Is depth perception important? What arc of vision is required? Is color discrimination essential? What are the hazards—flying metal, fumes, harmful light, etc.?

The importance of correlation of vision analysis with job requirements cannot be overemphasized. For instance, it might be assumed that reading glasses would meet the requirements for near-point vision in an industrial job, but tests have shown that in only one case out of twenty are the lenses for near-point reading the best ones for an industrial job.

In observation of 199 employees in a hosiery mill who performed an intricate looping operation, it was found that those with poorer vision by the Snellen chart test were consistently the better producers. Of course, many of these employees need correction for distant vision, but if applicants for that job had been selected on the basis of the Snellen test alone the best workers would have been eliminated.

In the typical company about half the employees will pass all tests important to their jobs without requiring any immediate visual aids. If the average age of employees is high, however, the proportion needing correction will be higher. Type of industry is also an important factor, because of differences in visual requirements. For example, 75 per cent of all garment workers have visual problems requiring correction, as compared to 52 per cent of all textile workers. Among the employees already wearing spectacles, many will be found to have lenses not suited to their jobs, because their spectacles were not obtained with job requirements under consideration.

As stated, all but a small fraction of the inefficiencies important to a job can be corrected by professional care. In some cases visual training can achieve corrections which could not be achieved by lenses.

Seeing properly is, to a large extent, a skill. It involves mind, muscles, and nerves. Sometimes we develop bad visual habits. They may result from an unsuccessful attempt to compensate for a visual inefficiency. Visual training, which in layman's language consists of "eye exercises," develops proper visual habits. It makes mind, muscles, and nerves respond as they should for us to see properly. Several types of visual inefficiency are characterized by failure of the two eyes to work together harmoniously. Such problems are especially susceptible to correction by visual training. Some persons fail to develop proper visual habits in early youth. Many poor readers are in this group. Even though the fault is of long standing, it can often be corrected by visual training. Another important benefit of visual training is in learning to use

GOOD LIGHTING is an important aid to good seeing. Note the dark areas, the bright spots, the glare from machines in the photograph on the left. At the right, the same shop with modernized lighting. No shadows, no glare, uniform visibility

bifocal lenses, or trifocals, which are becoming common for persons requiring visual correction for three distances.

Where lenses are required, three important steps should be followed:

1. Visual analysis should be comprehensive and accurate so that the patient's exact requirements are determined.

2. Lenses should be properly ground to fit the exact individual requirements, and frames should be of materials and type suited to the wearer's job and individual preferences.

3. The finished spectacles should be verified, fitted, and reevaluated, by the vision specialist.

The first two points are fairly obvious, but it is on the third that many attempts at visual correction fail. Unless there is precise fitting so that the lenses are in correct position in relation to the eyes, they can be a handicap to vision instead of an aid. Careless fitting by laymen is one of the major reasons why corrective safety goggles are so often worn "in the pocket" instead of on the eyes. By improper fitting they may actually cause discomfort.

Where comprehensive examinations are given by a professional vision specialist, pathology will be discovered and the employee informed of it so that he will know that he needs further care. Caution must be taken not to mislead the employee as to the extent of the examination given him. He should know that simple visual aptitude tests are not designed to reveal pathology. He may pass such tests and still need professional attention.

Furthermore, it should be understood that the industrial vision program does not seek to cover the patient's needs for his personal life. The attention he gets in connection with his job may be far different from what he needs for his hobbies, for instance. On the job, near-point vision may be stressed, while away from the job, he may be a hunter and have an entirely different problem, or he may require distant acuity on the job and have a hobby of tying fisherman's flies which requires exceptional near-point vision. Anyone who drives an automobile requires visual capacities which are not likely to be covered in analysis for an industrial job.

LIGHT AND PAINT

How well one sees, depends to a large extent upon lighting, and no industrial vision program is complete without careful attention to light and paint. It has been estimated that 20 per cent of all accidents are caused by improper lighting.

The physical environment of a plant should be made as favorable to good vision as possible. Great strides have been made in using light and paint to aid vision and worker comfort, and advantage should be taken of the wealth of new knowledge in this field. Among the major questions to consider are these:

Is there adequate light, particularly in critical work areas?

Is there freedom from disturbing shadows?

Is there freedom from large dark areas which tire the eyes of employees when they look up from their work?

Is there minimum of glare?

Is paint used to bring out desirable contrasts?

Are light and paint used to make surroundings as pleasant as possible?

Often poor lighting uses more kilowatt-hours of electricity than good lighting, well planned. In many cases paint can increase the effectiveness of a given amount of light. Consequently, avoiding the modernization of lighting and painting may be a costly economy, aside from the handicap to vision.

HOW TO SET UP A VISION PROGRAM

Let us see how a typical company launched and carried out a vision program. It will illustrate step-by-step progress in appreciation by management of what could be accomplished, and the expansion of the program from modest beginnings.

In 1938 the president of the company, realizing the eye hazards in the industry, became convinced that an eye protective program was needed.

It was planned first that each employee should be required to wear plain protective goggles, but a quick survey revealed that many employees were already wearing glasses for correction of visual inefficiencies. This meant that their safety goggles should have corrective lenses also. The question naturally arose as to whether many of those without glasses might not need them. It would be a mistake to provide uncorrected safety goggles for them without examination.

At this stage a local optometrist was consulted. After several conferences with the president, the safety engineer, and several foremen, it was decided that all employees would be screened to determine their visual capacities as far as safety was concerned. This would determine which employees should have plain safety goggles and which corrective ones.

Embarking on a program as ambitious as this seemed too costly, and nothing further was done until an accident occurred in which an employee lost vision in one eye. The program of testing all employees, preparatory to providing safety goggles, got under way immediately. The truism that unnecessary accidents cost far more, in compensation claims, than protective programs do, was dramatically demonstrated.

To keep the program as simple as possible for the purposes then in mind, tests were made for far acuity, near acuity, pathology or abnormality, and color discrimination. It was found that 40 per cent of the employees were not able to meet the liberal standards that had been set up.

Those who failed the test were informed and instructed to visit their own eye doctors for further examination. Each employee was also instructed to get a copy of his prescription so that corrective-protective goggles could be made for him, with half the cost borne by the company. The response was so poor that the company finally provided the goggles without charge.

Job Standards Established

The next step in this company's program was pre-employment screening from the standpoint of vision adequate for safety. From this followed establishment of standards for various jobs. The first breakdown was simple—one standard for crane men, another for all in the die room and machine shop, and another for the shipping department.

In this plant steels of different carbon content were used, and the finished products were denoted by painting the ends of the bars with code colors. Before the visual program had been put into effect a large order was found, when it arrived at its destination 500 miles away, to be of the wrong type. A mistake had been made by a shipping room employee who was color blind. Color discrimination became an important factor in this plant.

Two years after the program had been launched another complete examination was made. This was more comprehensive than the first, but it was found that only 10 per cent of the employees needed further attention. Production in the plant had increased 50 per cent, but the accident rate had declined 27 per cent.

Management is now so proud of its vision program, and so well pleased with its results, that it has again expanded it to cover production records on each man, so that all employees can be classified according to visual abilities, not only from the angle of safety but also from the factor of efficiency. This is already in effect for all newly hired employees. The program has also been coordinated with lighting and painting, and special emphasis will be placed on these factors in new construction and renovation now in process.

In Larger Companies

In larger companies, highly departmentalized, coordination becomes a more serious problem.

Because of its company-wide aspect and its vital connection with industrial relations, the vision program should have top management supervision. Carrying out details of the program falls largely on the shoulders of the vision specialist, industrial relations director, safety director, and various foremen.

It must be made clear to employees that the person supervising the testing of their vision is a representative of top management.

Top management supervision is necessary to see that all of the many phases of the program are coordinated and carried out at the right time by the various departments involved. If the employee educational campaign, essential to success, is neglected, the whole program may fail. Unless lighting and painting are given proper attention at the right time, the program is handicapped. Foremen must give employees adequate time for testing. The safety engineer, above all, must be cooperative.

Many policy matters in a good vision program will require top management decisions. One of the questions is what type of visual service to select. This may depend upon what services are available in the community. If a company has a health department it may find it practical to add a vision specialist to its staff, whereas a company without such a department and without experience with one may prefer to seek outside service.

Before starting vision testing of employees or visual job analysis there should be an internal public relations campaign to "sell" the program to employees. This should be continued vigorously to prevent sus-

picion that the vision program is a "scheme" to screen out undesirable employees. The benefits of the program should be explained in the company house-organ and at employee meetings, and the explanation must be in terms that employees understand.

Foremen and other supervisory employees should be thoroughly familiar with the program and its objectives so that they can answer questions. Union officials should be enlisted as leaders to obtain acceptance of the program.

Above all it should be emphasized that the vision program will help employees do their jobs better and hence increase their chances for advancement and contribute to their health and well-being. It is not designed to eliminate them from the company.

Employee education in vision is important not only to obtain acceptance of a company vision program, but it may also be beneficial to morale. It has often been found that visual surveys, without corrections, improve job performance. Setting standards of performance and drawing attention to job proficiency tends to make workers develop methods of self-improvement.

Where a better understanding of vision is developed there is less tendency for employees to conceal their visual problems, and employees encourage each other to wear their corrective spectacles and safety goggles.

MAINTAINING GOOD VISION

To maintain good vision in a company there must be frequent check-up. A single performance of examining and correcting may produce highly favorable results, but the good effects will soon disappear unless there is periodic rechecking. Employees must be reexamined, and job requirements, lighting and safety conditions in the plant must be rechecked (see check list below).

Seeing is an intricate process, and one's ability changes, especially after middle life. The employee who needs no correction today may in a few months, and the lenses that are right today may need to be changed at the time of the next examination. Employees change jobs, and visual conditions at the same job may change as machines are moved. Paint becomes grimy and lights are changed. Special attention must be given to checking accident-prone employees and those with out-of-the-ordinary inefficiencies.

A good educational program on vision will do much to make employees vision-conscious. Such a program should be permanent. Employees who are vision-conscious will often detect their own inefficiencies, and an important part of the company's continuing program should be provision of facilities for easy checking.

CHECK LIST

1. Do we have a good vision education program?

- ____Show advantage of vision care to employee
- ____Emphasize safety
- ____Use house organ
- ____Use employee meetings
- ____Pay special attention to informing foremen
- ____Enlist cooperation of union officials

2. Is visual analysis adequate?

- ____Distance fixation
- ____Near-point fixation
- ____Depth perception
- ____Field of vision
- ____Color discrimination
- ____Pathology

3. Is job analysis adequate?

- ____Distant vision
- ____Near-point vision
- ____Depth perception
- ____Arc of vision
- ____Color discrimination
- ____Hazards

4. Do we provide best possible visual environment?

- ____Maximum use of natural light
- ____Adequate artificial lighting, especially of critical work areas
- ____Absence of dark areas
- ____Absence of confusing shadows
- ____Paint for contrast
- ____Paint for pleasant surroundings

5. Is eye safety program best possible?

- ____Safety goggles where required
- ____Corrective safety goggles where required
- ____Elimination of avoidable hazards
  - ____Flying particles
  - ____Fumes
  - ____Glare
  - ____Harmful light, such as X-ray

6. Is visual correction program adequate?

- ____Comprehensive analysis
- ____Proper lenses
- ____Proper fitting
- ____Visual training
- ____Referral for pathology
- ____Matching worker and job

7. Is program well-managed?

- ____Coordination by top management
- ____Necessary orders from officer with authority
- ____Careful attention to policy decisions
  - ____Selection of professional service
  - ____Screening — quick testing of occupational capacities
  - ____Division of costs
  - ____Systematic method of informing employees of results
- ____Provision for continuity of program
  - ____Permanent vision education program
  - ____Rechecking vision periodically
  - ____Rechecking job requirements
  - ____Service on corrective and safety eyewear

A PLANT HOSPITALIZATION PLAN WITH UNUSUAL COVERAGE

The industrial hospital and medical care plan now in operation at Hoffmann-La Roche, Inc., Nutley, N. J., is far advanced in the type and extent of benefits it offers. It includes features so new when undertaken some 2½ years ago that the company frankly announced that the absence of any established record of experience by its own or any other insurance carrier might necessitate changes because of costs higher than estimated. The first year of operation, however, was so favorable that further improvements were made on January 1, 1946, to bring the plan to its present status.

The following are some of the more unusual provisions of the plan, which allows the employee to select his own doctor (medical, osteopath, or dental surgeon) and to choose any hospital in the United States:

1. Employee is reimbursed for medical fees for illness or non-compensable accident keeping him away from work, up to a maximum of $75 during any one continuous period of disability (annual limit of $75 for over age 60). Payments for medical treatments are regulated at $3 for each home or hospital call, and $2 per call at the doctor's office.

2. When the disability exceeds seven calendar days' duration, medical fee benefits are paid on the same scale shown in (1) for a maximum of three calls for convalescent treatment following the employee's return to work and within 31 days thereafter.

3. There is no limit to either (a) the number of disabilities or (b) total days of hospitalization, in any one year. A daily hospital benefit of $6 per day is paid up to a maximum of 31 days during any one continuous period of disability.

4. Reimbursement up to $15 is made for fees for administration of anesthetics by an anesthetist outside of a hospital in connection with surgical operations. This takes care of numerous minor or emergency cases handled in a doctor's office or elsewhere than a hospital.

5. There are no exclusions because of communicable diseases, plastic surgery, or for hospitalization for diagnostic purposes. The coverage applies, among other things, for example, to reimbursement up to $60 for any combination of hospital services, such as X-ray, laboratory, electro-cardiogram, cystoscopy, ambulance, oxygen, medications, basal metabolism, anesthetics, and operating room. This is a big help in cases requiring no surgery, but involving other heavy charges.

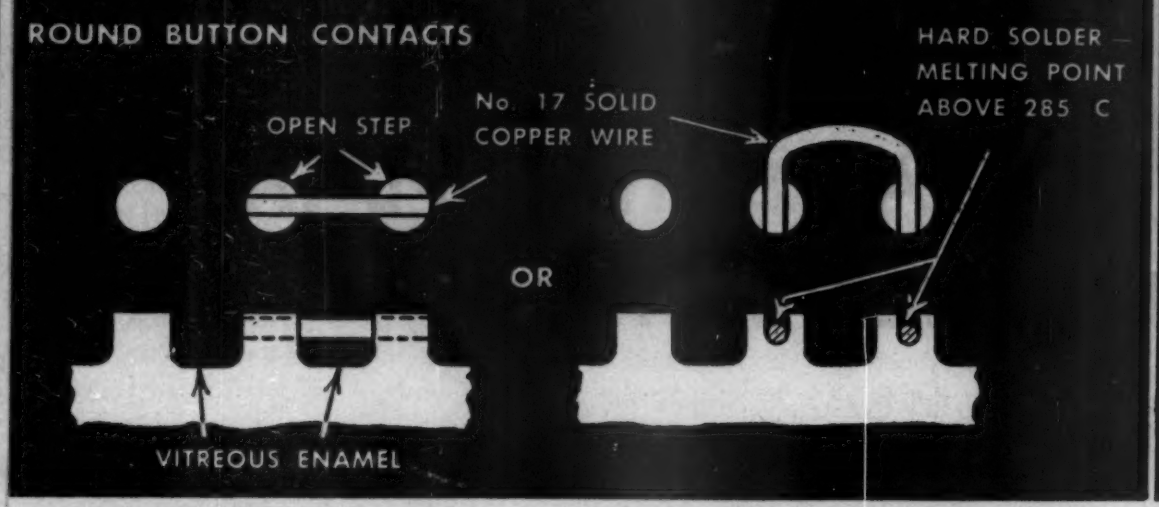
6. The schedule of surgical operations is unusually broad, and includes payment for any cutting operation, up to a maximum of $200 for the more serious. It even includes blood transfusions, and injection treatments for varicose veins and stomach ulcers.

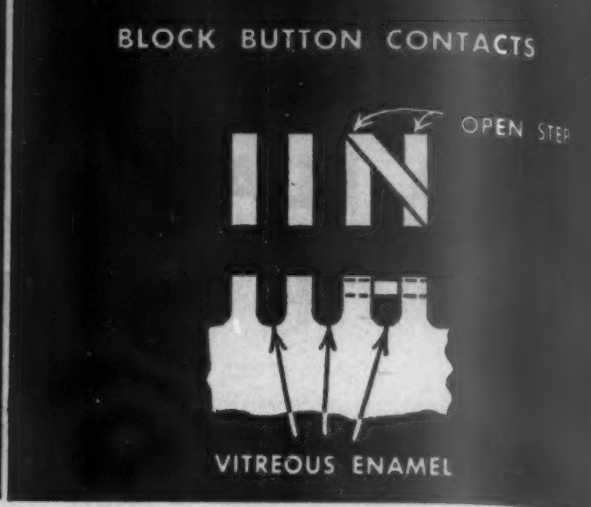
7. Dependent spouses (husband or wife) of employees are included, and children from 3 months to 18 years of age, without medical examination. The problem of determining what is a dependent husband was settled on the definition that such spouse must be wholly dependent for four months prior to the disability. In addition to these provisions, there are maternity benefits, with reimbursement for prenatal and postnatal care up to six visits.

INSURANCE BENEFITS FOR WHICH EMPLOYEES OF HOFFMANN-LA ROCHE, INC. AND THEIR DEPENDENTS ARE ELIGIBLE

	BENEFITS FOR EMPLOYEES	BENEFITS FOR DEPENDENTS
1. Daily benefit for hospital board and room	$6.00	$6.00
2. Maximum benefit for additional charges:		
(a) in connection with hospital confinement	$60.00	$60.00
(b) in connection with maternity case	$30.00	$30.00
3. Maximum surgical operation benefit	$200.00	$200.00
4. Benefit reimbursing for physician's fees or medical treatment, each call:		
(a) at home or hospital	$3.00	none
(b) at doctor's office	$2.00	none

NOTE: Each of these is a separate benefit, and payable under any qualifying item during the same disability





AN OPEN STEP on faceplate rheostats may be short circuited by soldering a jumper in slots cut as shown into the contacts connected to the open coil. After soldering, the contacts are smoothed with a fine file or abrasive paper

HOW TO MAINTAIN MOTOR-DRIVEN RHEOSTATS

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Inadequate maintenance of a motor-driven rheostat not only decreases its operating life, but also may result in costly production shutdowns. It is not a critical device in this respect, however, since most rheostat assemblies are sturdily constructed and designed for long life performance with a minimum of maintenance. By observing the few basic maintenance precautions outlined here, a properly designed motor-driven rheostat, correctly applied, will provide many years of dependable, uninterrupted service.

Rheostats are simply resistors that are provided with a means for varying their resistance. Those equipped with motor-drive units are used in industry on motor speed control systems, automatic battery charging equipment, generator controls, and in numerous other applications where it is desirable to control the rheostat automatically or from a remote location. Motor-driven rheostats used for these control purposes are known as the built-in plate type, the external plate type, or the faceplate type.

Plate-type motor-driven rheostats with either built-in or external type motor units are used in the lower current capacity applications. These rheostats commonly use vitreous enameled steel plates ranging from 6 to 18 inches in diameter with sigma watt capacities of 330 to 2000 watts per plate, respectively (sigma watts=I max. $\times$ I min. $\times$ R). The rheostat plates may be arranged in a single or multi-deck assembly, depending on the requirements.

Such rheostats may be equipped with circular, small block button, or large block button stationary contacts. Both the contacts (except for the contact surfaces) and the alloy resistance wires are embedded in vitreous enamel.

Plates with small block buttons are used primarily where a large number of resistance steps are required, providing fine control. On certain applications where the watt capacity necessary exceeds the rating of the circular plates, rectangular plates measuring 15x24 inches, and having a sigma watt capacity of about 2500 watts, are employed.

Faceplate rheostats are considerably larger in size than either the rectangular or circular rheostats. The stationary contact buttons are mounted directly on an insulating faceplate and are electrically connected to the high-current resistors mounted back of the faceplate.

RHEOSTAT CONTACTS. Rheostat movable contacts, which are of the sliding type, as distinguished from the butt or wiping contacts commonly used on control components such as relays and contactors, usually are made of pressed copper-graphite, silver-graphite, or similar materials. These metal-graphite materials are self-lubricating, and have relatively low contact resistance and suitable wearing qualities.

In general, the amount or severity of rheostat contact wear depends on the frequency of operation. Units that are in constant operation, for example an automatic load-regulating application, should be checked periodically every three months, whereas those functioning intermittently need be inspected only every six to nine months.

The stationary contacts of rheostats usually are made of brass or copper, brass being most commonly used. On plate-type rheostats the stationary contacts are non-replaceable, whereas those on the faceplate type are designed for easy replacement. In wearing qualities the stationary contacts are decidedly better than the movable contacts. Abnormally rapid contact wear usually is caused by broken, deformed, or improper contact springs, which in turn may cause excessive contact pressure. Increased contact wear also may be caused by uneven contact surfaces because of exces-

sive arcing, which results in burning or pitting of the contact surfaces. Uneven contact surfaces should be smoothed over, using a fine file or fine sandpaper.

Severely pitted contacts or excessive arcing between the movable and stationary contacts may be the result of an open resistance step. This condition can be alleviated temporarily by short-circuiting the open step. As soon as time permits, however, the open step or steps should be replaced.

Where the resistance steps are of the non-replaceable type, it is advisable to replace the entire rheostat plate. This procedure is recommended where three or more steps are open, or where a fine degree of control is necessary.

Movable contacts that are chipped, cracked, broken or badly worn must be replaced promptly to avoid rheostat failure or severe damage to the stationary contacts. When ordering replacement contacts, or shoes as they are often called, complete nameplate data must be supplied to the rheostat manufacturer so that the proper contact can be selected.

Under no circumstances should rheostat contacts be oiled or otherwise lubricated. Oiling tends to soften the movable contacts, decreasing their wearing qualities and oftentimes causing excessive burning or arcing. It is necessary to keep rheostat contacts, like those in other electrical equipment, free from dirt and oil.

LIMIT SWITCHES. Built-in motor drives commonly use snap-action-type limit switches, whereas the open types of motor drives utilize the larger lever or rotating-type limit switches. These mechanically actuated control devices function to limit the travel of the rheostat contact arm, preventing damage caused by overtravel.

Electrically, one limit switch operates to open the pilot or control circuit when the rheostat contact arm reaches the "all resistance in" position whereas the other opens the control circuit when the "all resistance out" position is reached. Opening of either limit switch stops the motor, setting up the circuit for motor reversal, which is accomplished either automatically or by pushbutton control.

The limit switches are to be inspected for worn contacts and excessive amounts of dirt or oil. Since most limit switch contacts are silver, they require no periodic filing or dressing.

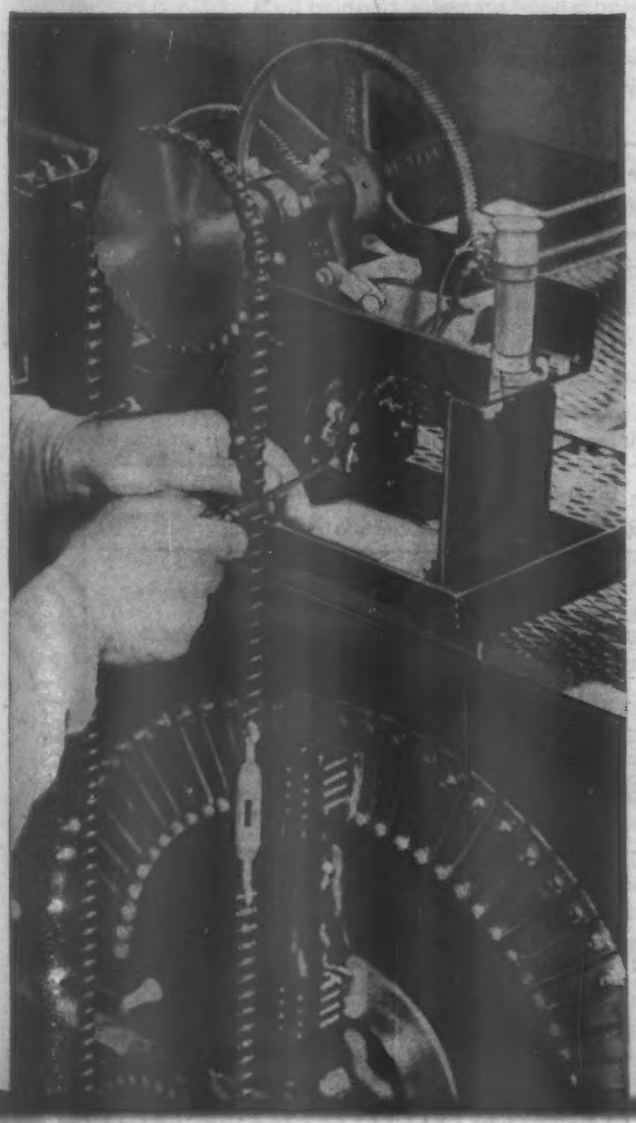
Check limit switch bearings or hinge points for proper lubrication. If the switch does not operate smoothly, put a slight amount of oil on the bearings or hinge points. All adjusting, clamping, or terminal screws on the limit switch should be tightened, if loose.

Practically all motor-driven rheostats are provided with a means of adjusting the position or point at which the limit switch at either end of travel opens. This adjustability feature is necessary in many rheostat applications to limit the flow of current in the rheostat circuit to some desired value.

With open-type rheostat drives, this adjustment is accomplished by cams that are fastened to the drive shaft. With built-in drives, adjustable stop cams are mounted on the disk shaft assembly of the gear mechanism.

MOTORS. The rheostat driving motor requires the same care as any fractional-horsepower motor. On most rheostats the split-field series universal type of motor is used since it is suitable for either d.c. or a.c. operation and it may readily be reversed.

If the motor is in constant operation, the brushes, brush-holders, and commutator ought to be inspected every six months. Replace worn-out brushes immediately, to minimize arcing and possible damage to the commutator. Because of



REPLACING WORN BRUSHES on the universal motor that is used to drive this faceplate rheostat. Brushes, brush-holders, and commutators should be inspected every six months

ADJUSTING THE TIMING of a built-in motor-driven rheostat by shifting the adjustable band on the speed-regulating resistor

MAINTENANCE PROCEDURE FOR MOTOR-DRIVEN RHEOSTATS

WHAT TO CHECK	WHAT TO INSPECT FOR	HOW OFTEN*	HOW TO CORRECT
Movable contacts	Chipped, cracked, or broken contacts	Every 6 months	Replace promptly
	Severely pitted contacts or excessive arcing between stationary and movable contacts	Every 6 months	This condition usually is the result of open resistance step. On plate rheostats one or two open steps may be short circuited. If more than two steps are open, replace the plate. On faceplate rheostats the open or burned-out resistors can be replaced Construction of the faceplate rheostat also permits replacement of stationary contacts. Both types of rheostats permit replacement of the movable contact shoes
	Excessively worn movable contacts	Every 6 months	Replace. This condition may be due to excessive contact pressure, or uneven contact surfaces caused by open steps
	Excessive amounts of dirt, oil, or other matter	Every 2 months	Remove with carbon tetrachloride or other non-flammable cleaning fluid. Do not lubricate the contacts
Stationary contacts	Excessive wear	Annually	This condition usually is caused by grounds, open resistance steps, or high contact pressure. Under normal operation these contacts will outlast the associated parts. Keep the contacts clean
Cams	Loose setscrews	Annually	Tighten
Slip clutch	Abnormal amounts of dirt or grease	Annually	Clean with a non-flammable cleaning fluid
	Proper adjustment	Annually	Readjust if setting has been disturbed. The clutch should not permit slippage of the rheostat contact arm but allow manual turning of the arm
Speed reducer	Proper lubrication	Annually	Fill housing to three-quarter capacity with extra-light gear grease. When renewing grease be careful to prevent the entrance of dirt into housing
Shaft bearings	Proper lubrication	Annually	Lubricate only if the bearings are provided with oil cups. Other types usually are self-lubricating
External gears	Excessive dirt or other matter	Every 6 months	Remove with a non-flammable cleaning fluid
	Proper lubrication of bearings	Annually	Lubricate with a medium-weight oil, such as SAE 30
Sprockets and chains	Excessive dirt or other matter	Every 6 months	Clean and lubricate with a medium-weight oil. Use grease sparingly
Limit switches	Badly worn contacts, loose adjustment screws, proper lubrication of bearings or hinge points	Every 6 months	Replace, tighten, lubricate with a light oil
Motor	Worn brushes, excessively rough commutator	Every 6 months	Replace. If sanding the commutator is not sufficient to smooth the surface, turn it down
	Proper lubrication	Annually	Lubricate with a few drops of medium-weight oil such as SAE 30. Do not overlubricate
	Excessive noise	Every 6 months	Motor may need lubrication, or replacement of worn bearings or brushes
All terminal connections	Loose connections	Every 6 months	Tighten. Check connections to rheostat, limit switches, motor, other parts
Timing	Improper timing	Annually	Readjust speed-regulating resistors. Always check the timing after a complete inspection of the motor or speed reducer

*Interval between inspection usually is dependent on duty or severity of operation. Times shown are average for most installations. For heavy-duty service, wherein the unit functions 24 hours a day, reduce times shown by 50 per cent.

the reversing service required, care must be taken to see that new brushes ride or seat properly on the commutator.

Through use the commutator becomes highly polished and assumes a uniform dark color. This condition is normal, indicating that brushes and commutator are wearing properly. If the surface of the commutator becomes rough, however, smooth it over with a piece of fine sandpaper. Excessively rough commutators must be turned down and the mica undercut.

Motors provided with oil cups must be lubricated annually with several drops of medium-weight oil (SAE 30). Avoid adding an excessive amount of oil. Overlubrication of the motor causes overheating, churning, and oil leakage. Do not use a heavy lubricant, because the motor bearings may be damaged and the speed affected.

Examine excessively noisy motors immediately to determine the trouble. Lack of sufficient lubrication, worn bearings, or worn brushes are some of the primary causes of noisy motors. The reduction gears also should be checked when noise occurs.

Keep the armature and field coils free from dust and dirt. Excessive accumulations of dirt should be removed with a damp cloth and the coils then blown out with low-pressure air.

SLIP CLUTCH. The slip clutch performs two main functions: (1) It permits disconnecting the rheostat from the motor unit so that manual operation can be used in emergencies or when repairs are made; (2) it protects the rheostat and its contact arm against over-travel caused by limit switch failure.

The slip clutch, however, does not provide overload protection to the motor in case of limit switch failure.

Normally the slip clutch must be adjusted so that the motor will drive the rheostat contact arm or arms without slippage. At the same time, it should be loose enough to permit manual turning of the rheostat drive shaft. Excessive clutch pressure will prevent the clutch from slipping and may result in stripping the gear mechanism.

Failures of slip clutches are exceedingly infrequent provided, of course, that they are set or adjusted properly. The clutch requires no lubrication. Excessive accumulations of dirt must be removed as a protection against possible jamming.

SPEED REDUCER. Most speed reducers are of the worm gear type and reduce the motor speed of approximately 1750 down to a few revolutions per minute. If any further reduction in speed is required, it is obtained by an external gearing system or through speed control of the driving motor.

EXTERNAL GEARS. The external gears driven by the speed reducer rotate the shaft that drives the rheostat contact arm. Lubricate bearings of the external gears annually with a medium-weight oil (SAE 30). Remove accumulations of dirt from the gear teeth with a non-flammable cleaning fluid. Do not oil or grease the gear teeth.

SHAFT BEARINGS. Like sliding contacts, shaft bearings usually are self-lubricating. If bearings with oil cups are provided, however, periodic lubrication is required. Refer to manufacturer's instruction sheets for lubrication data.

CHAIN DRIVES. Some motor-driven rheostats, especially the large faceplate type, have sprocket and chain drives or flexible shafting, where it is necessary to mount the rheostat section above or below the motor-drive unit. Mountings of this type often are required where the space to be occupied by the rheostat is limited. Sprockets and chains or flexible shafting should be lubricated annually with a medium-weight gear grease.

VENTILATION. Rheostats function by the dissipation of electrical energy in the form of heat. It is most important, therefore, to insure that they have sufficient ventilation. Motor-driven faceplate rheostats usually are mounted in an iron frame, whose sides are enclosed in steel mesh. This mesh must not be covered up, since excessive heating of the rheostat may result.

Do not mount rheostats at locations that are subject to excessive ambient temperatures. Also to be avoided are mounting locations where moisture may drop on the rheostat. If such locations are unavoidable, the rheostat manufacturer should be notified, so that the necessary changes in design can be made.

BURNOUTS. If resistance steps in the rheostat burn out because of improper ventilation, short-circuit conditions, or grounds, temporary repairs can be made by shorting out the burned-out steps. With the steel plate-type rheostat this can easily be done by soldering, using hard solder, a copper wire between two adjacent contact buttons, as shown on page 118. After soldering, smooth the surface of the contact buttons with a fine file or sandpaper.

When the vitreous enamel has bubbled in the vicinity of the burnout, chip away any enamel extrusions that interfere with the movement of the rheostat contact arm.

If several steps are burned out, the rheostat plate will have to be replaced because the regulation will be irregular, and overheating of the entire plate or portions of the plate may occur.

The procedure in the case of a burnout on a faceplate rheostat is to short circuit the open step or steps by connecting (behind the insulating panel) the terminals of the open resistors with a copper strap or wire. The wire used must be of sufficient size to carry continuously the maximum rheostat current. The burned-out resistor ought to be replaced as soon as possible, to provide safe operation.

TERMINAL CONNECTIONS. Terminal connections to rheostat, motor, and limit switches should be inspected periodically for loose connections. They are usually the result of excessive vibration or careless installation and, if not corrected, they may cause overheating at the terminals, arcing, change in rheostat resistance, and operating failures.

Irregular or spasmodic operation, wherein the unit functions properly for a time, fails for a few minutes, and then resumes normal operation, is a good indication that one or more loose connections are present.

LEAD-TIME CHART INSURES CLOSE SCHEDULING

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PROBLEM: To develop detailed production scheduling in a large metal-working plant, which is characterized by intermittent rather than process or continuous manufacturing. Solving the problem requires regulation of the work orders which call for production of thousands of different shop-made parts, merging with an even larger stream of purchased parts on but two separate assembly lines. On these busy lines erection of numerous end products and models alternates weekly. Close timing is of vital importance, and detailed scheduling as well as rigid control over work-in-process is necessary.

SOLUTION: Two simple forms and a series of visible index files. The new set-up permits four people instead of fifteen to do the central scheduling and the machine loading.

A combination lead-time chart and assembly schedule was devised. This dual-purpose sheet begins with the assembly schedule. Individual lot numbers and quantities are listed in columnar form on the left side of the sheet. Also shown is the daily rate at which each production lot of machinery is to be assembled —15, 25, 35, etc.

Working across the paper, a space is lined off to represent each working day of the month. The so-called A-day is the first day of assembly designated for each lot. Three days prior to A-day, the Number 0 is entered on the calendar and becomes the latest completion date for *final operations* on all shop-made parts required to build that particular lot. Operations other than final operations are completed beforehand. The schedule is made by continuing to work backwards from A-day and A-minus-3, moving toward the left side of the page and increasing the total of "operations to follow" at 3-day intervals.

The numbers 1, 2, 3, etc., fall into the calendar dates by which a foreman should complete one specific operation on work-in-process on which 1, 2, 3, etc., *additional operations* have to be performed. These dates became known as "operations to follow due dates." This type of control became particularly useful for parts that are routed through several different machining departments before completion, and it even affords an excellent check for successive intradepartmental operations.

At a glance, each foreman or his production control assistant can determine the relative urgency between an easily made part needed soon on the assembly line and a many-operation part not needed on the line until weeks later.

The 3-day interval allowed between operations is no more than a working figure. On some parts, three

LEAD TIME CHART
(OPERATIONS TO FOLLOW DUE-DATES)

LOT NO.	QUANTITY	UNIT	PER DAY	APRIL																	
				1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	22	23	24
778						0			A												
892						1			0			A									
893						1			0			A									
734				3			2			1			0			A					
734					7			6			5			4			3			2	
854					6			5			4			3			2			1	
895				8			7			6			5			4			3		
										9			8			7			6		
										13			12			11			10		
																			6		

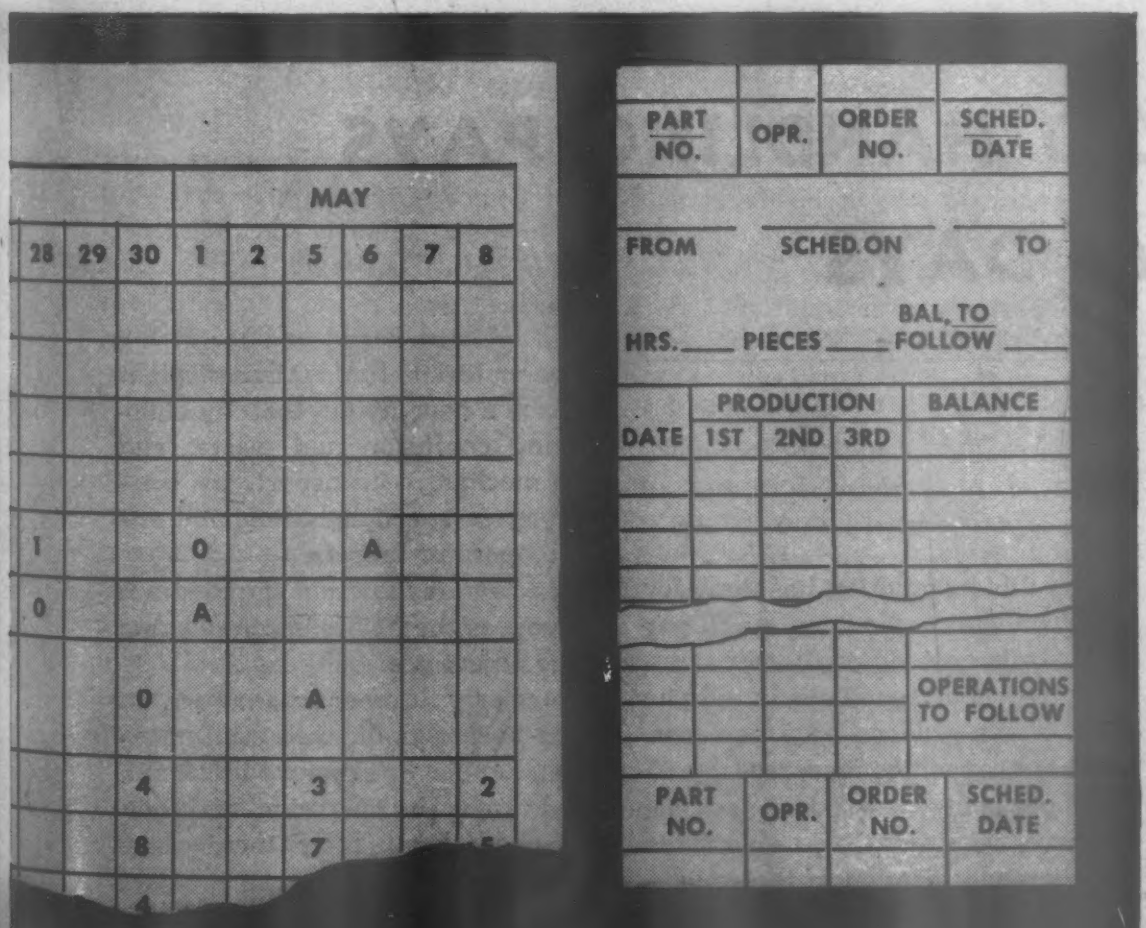
LEAD TIME CHART set up by production control gives vital information in the first four columns at left. *A* stands for the first day of assembly, while *O* is the latest completion date for final shop operations. Each foreman has the status of the work for the month before him

days between operations is too long; on others it is too short. But three days is satisfactory on an over-all basis and provides control which is elastic enough to be practical. In three days it is almost invariably possible to complete enough parts on one operation to keep the next machine busy. There are special methods to handle the small percentage of exceptional cases.

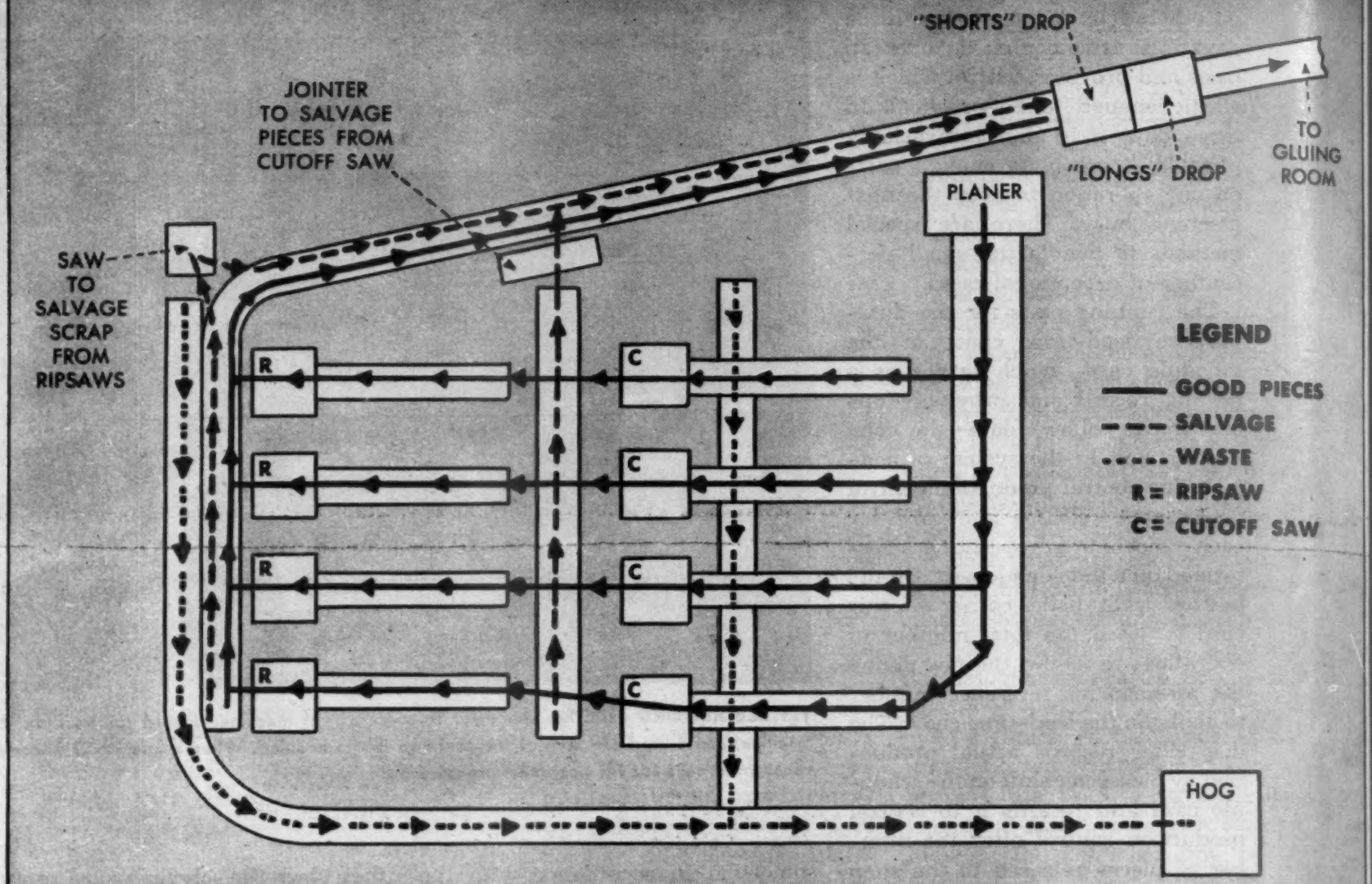
The running mate for the dual-purpose lead-time chart is the schedule card, which serves as a posting record and provides "operations to follow" data—the connecting link in the system of control. The central production control department releases one card for each machining operation performed on a shop-made part. On the bottom right hand corner of this card is noted the total number of operations to follow, thereby giving the foreman his reference number to apply on the lead-time chart. The dispatcher records actual production by pieces per shift on the schedule card and returns it to central production control after the number of pieces released to the shop have been completed. These cards then act as credits to the machine load debit balances maintained in the central control ledgers.

From here on, the system varies somewhat in accordance with the different departmental situations. In general, however, the foremen have visible index files which contain three spaces for each machine in their departments. In space No. 1 they place the schedule card representing the work being run on the machine at that time. Spaces 2 and 3 for each machine are filled by cards representing the work next to be run. Schedule tickets of advance work load for the department are kept in another group; as a No. 3 place opens up in the file, the foreman selects an urgent card from the advance load to take a place of waiting. Advance file cards for which material is not available are segregated to prevent scheduling of unavailable work. If conditions beyond control postpone assembly of one lot, all subsequent lots waiting their turn on the same assembly line are necessarily pushed back. If one of these monthly lead-time charts should get as much as one week out of balance, a revised chart is quickly issued. Keeping the scheduling system current has become that easy.

VISIBLE RECORD FILE has space for three cards per machine; a card for work on the machine, and a card for each of the next two jobs scheduled. When space No. 3 becomes vacant, the card for the next most urgent order is inserted



SCHEDULE CARD is released by production control for each machining operation on shop-made parts. It provides "operations to follow" link in the production chain. Foreman can check back to lead time chart



RAW LUMBER moves from roller conveyors at top to planer (upper right), down conveyors to cutoff saws. Short boards go to jointer; waste to waste conveyor. From cutoff saws, standard lumber moves through ripsaw stations and by conveyor moves to the sorter (upper right), thence to gluing machine and finishers

CONVEYORIZED HANDLING PAYS ITS WAY IN 60 DAYS

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Conveyorization of a new layout is saving Ed. Roos Company $130 a day. One hundred thirty dollars may not sound like very much, but it becomes important when it compared with the installation cost of only $7500. That means the original investment was returned in less than 60 working days.

And here are some of the other things this installation has done for us. Production efficiency *up* 30 per cent. Unit cost *down* 10 per cent. Required floor space *cut* by 58 per cent. Waste *reduced* by 5 per cent. Machine capacities *increased* by 65 to 95 per cent.

There were two basic objectives in this modernization of the rough-lumber handling operation—(1) force materials to flow in a straight line, by a new layout, thereby eliminating confusion and waste; and (2) mechanize transport, by conveyors, to speed handling and reduce operator fatigue.

The layout shown in the diagram above was the key to accomplishing these objectives.

Formerly, lumber was moved on hand-pushed dollies. At each operation, lumber was removed by hand, lined up for the operation, and then restacked. Frequently there were from five to seven trucks arrayed about the machine—several for

STANDARD LUMBER coming from ripsaw stations is placed on the bottom (glue room) conveyor moving to the right. An addition to the conveyor, made subsequent to the photograph, separates salvageable waste for reclamation from standard lumber. Upper conveyor, moving to the left, is main waste conveyor

sorting lumber sizes and at least one for waste. The resulting congestion is not hard to visualize when it is remembered that this occurred at the planer, cutoff saw, ripsaw, jointer, salvage board cutting, and gluing stations.

The New Way

Under the new arrangement, lumber is delivered by lift truck to the primary planer in neatly stacked piles. Spacers, removed as lumber is unstacked, are placed in a trough-belt conveyor for return to the storage yard. Lumber is unstacked, fed through the primary planer station onto a powered conveyor which runs the width of the cutting room. An attendant on this line sorts the planed lumber and feeds it by size to the four cutoff saws. From the cutoff saws, standard lumber is fed directly ahead to one of four ripsaw stations; salvageable waste is conveyed to a jointer on the right side of the shop; scrap is tossed on a conveyor which runs to the main waste conveyor servicing the entire department.

Standard lumber is fed through the ripsaws where it is cut to width for gluing. Again lumber may go to one of three locations. Standard lumber is placed on the near side of a steel-belt conveyor which runs to the gluing room; salvageable scrap is placed on the far side of the same conveyor and is taken off at a scrap salvage saw. Following the salvage operation, it is again placed on the main conveyor which feeds to the gluing room.

The gluing-room conveyor, carrying standard lumber, makes a right turn after passing the last rip saw, picks up reclaimed lumber from the scrap salvage saw and the jointer. At this point the conveyor becomes inclined to accommodate an automatic sorting device for "shorts" and "longs."

After being sorted for length, lumber is fed, by conveyor, through the gluing machine, where, under heat and pressure, it is bonded into a continuous piece of stock. A cutoff saw, mounted on a traverse bar, cuts the glued stock into predetermined widths. These glued panels are then stacked for delivery to the veneer department.

Instead of production dropping during the two-month changeover period, it took an unexpected rise. This was explained by the fact that machines were moved, and installed with conveyors, one at a time.

MASTER SWITCHES—WHAT THEY ARE AND HOW TO SERVICE THEM

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APPLICATION, CONSTRUCTION, AND OPERATING

All pushbuttons, selector switches, and similar pilot devices are, technically, master switches. That is, they initiate the signal for the function being controlled by completing or interrupting the controlling circuit or circuits. The term master switch, however, applies essentially to a group of switches specially designed to withstand severe duty and give long life on applications such as cranes and rolling mill controls.

Because of their versatility the field of application for master switches is very wide. As an example, master switches with as few as 1 circuit and 2 positions to as many as 20 circuits and 20 positions each side of mid-position, and combinations between these two extremes, are available. The switch not only initiates the operation desired, but in many instances also controls the speed at which it is to be performed. With the many contacts all operated by one handle, the proper motion or operation is correctly interlocked so that each operation comes in its correct sequence.

Figure 1 shows a typical application of master switches on a whirley crane.

There are three types of master switches, commonly known as (1) cam, (2) drum, and (3) dial type.

The cam-type switch is shown in Figure 2, and its operating principle in Figure 3. Clockwise rotation of the cam shaft opens the right-hand contact, while the left-hand contact remains closed. The contact fingers rotate on the finger shafts. When the cams are returned to the position shown, the contact spring that keeps the rollers or cam followers against the cams returns the contacts to the closed position.

The drum-type switch, which is similar in appearance to, but shorter than, the cam type, consists of a mounting surface on which copper segments are fastened to form a dial, each segment being insulated from the others. The contact fingers are rotated over the segments, making contact with them in the desired sequence.

In tracing the circuit through a typical drum switch, first there is the finger that serves as a "common" to the remainder of the fingers to bring the current to the drum, which when rotated brings the other segments in contact with their corresponding fingers to complete the circuits in the proper order.

Common to all these types of switches is a positioning device. It may consist of a starwheel and pawl, a rigid notched member and moving pawl, or a spring-loaded roller on the handle that rolls along the frame, in which notches provide the positioning feel to the handle.

An advantage the cam switch has over the drum and dial switches lies in the relative ease with which the contact sequence of the switch can be changed. To change the closing or opening of a contact, only the contour of the cam is changed.

Keep Supply of Parts

To maintain the drum or segment-type switch, requires a stock of segments for the drum. Because of the many different sizes and shapes of the segments, this stock supply may be quite large. Renewal parts for the cam-type switch are relatively few in number, however, since more duplicate parts are used. The only difference is in the contour of the cams. Any desired contour can be

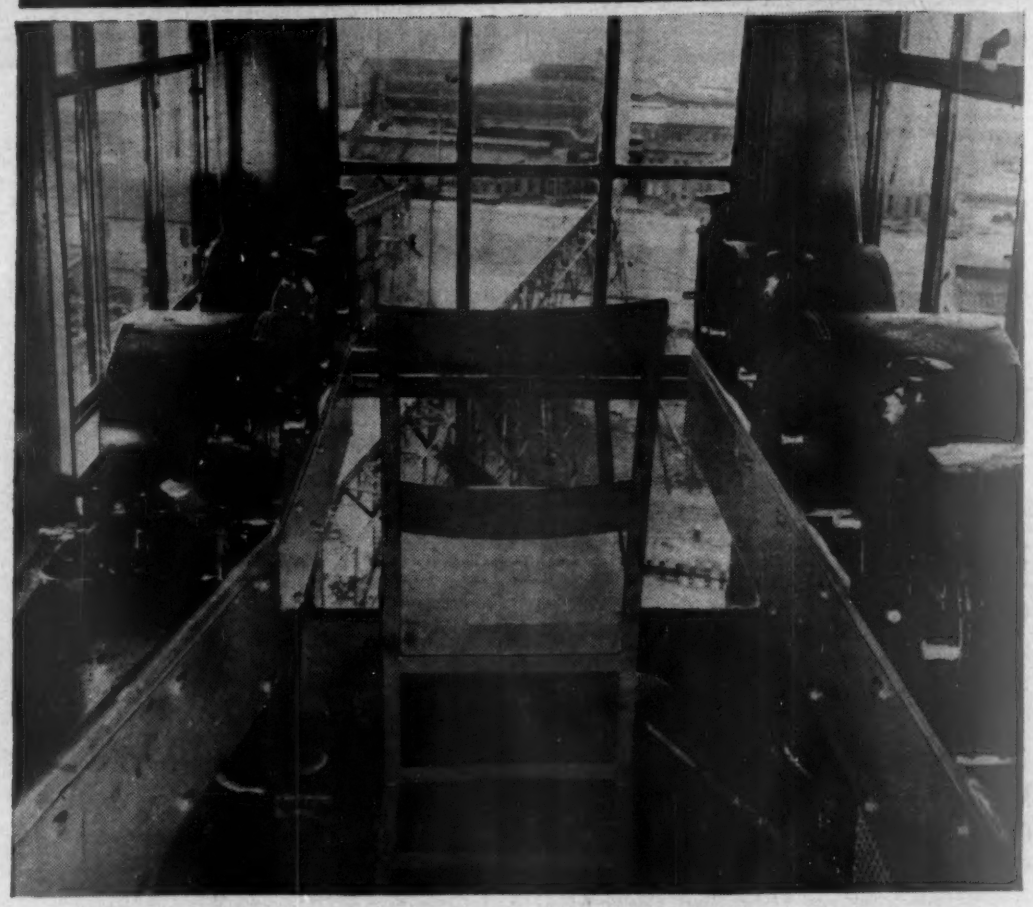

FIGURE 1. The master switches shown here at the left and right of the operator's chair control the motions of a 20-ton whirley crane, a typical application of such switches

made from a supply of full cams, from which material is removed to obtain the desired shape.

The advantage of drum and dial switches over the cam type is their smaller number of moving parts and the relatively simpler type of mechanism they employ.

SERVICING MASTER SWITCHES

Failure of a master switch to operate properly may be indicated by erratic operation of the motors being controlled. Suppose the handle of a crane master switch is moved to the first point, and the motion starts but then stops. By returning the handle to the off position and then moving it to the first point, proper operation of the crane is again obtained.

The failure on the first operation may be caused by (1) worn contacts; (2) worn cams; (3) worn bearings or other mechanical parts; (4) loose or broken connections; or (5) dust and dirt.

Worn Contacts. Most contact tips on cam-type switches are of the precious-metal type, consisting of some precious metal over a base-metal backing. When the precious metal is worn off, the base metal (usually steel) is exposed. Since the oxides of the base metal are poor conductors of electricity, the contact resistance may increase to the point where failure occurs.

Wearing of contacts on a cam-type switch may be brought about in two ways:

1. The contact or precious metal is worn off by the arcing at the tips when opening and closing, or by mechanical hammering and sliding when the contacts are closed.

2. Hammering out or mushrooming of the tip is experienced when the switch is operated at high speeds and when the contact pressure is too high.

Sliding contacts are used on both the dial and drum switches, and they are susceptible to sliding wear and arcing. Excessive sliding wear may be caused by the contact pressure being too high, the presence of abrasive dust or dirt, or a sharp projection on either the finger or the segment. If the contact pressure is too low, the heating of the segment and fingers causes excessive wear. Arcing causes the edge of the tip of the segment to be burned at the last point of contact when the contact is opened. This arcing roughens the segments and fingers, causing sliding wear.

Worn Cams. Worn cams cause failure by not opening the contact at the correct time, or by not opening the contact far enough. From Figure 3 it can be seen that if the rise on the cam is worn back to the line indicated, the cam must be rotated before the contact opens. Or if the wear at *B* causes insufficient gap at the tips, failure results. This excessive wear may be caused by the finger roller not riding on the full width of the cam. If the finger roller binds and fails to rotate on its bearings, the sliding of the roller over the cam surface causes excessive wear on both the roller and the cam.

When designing a master switch, the designer must keep certain principles in mind. The gap must be sufficient to interrupt the current

PRINCIPLE OF CAM-TYPE SWITCHES

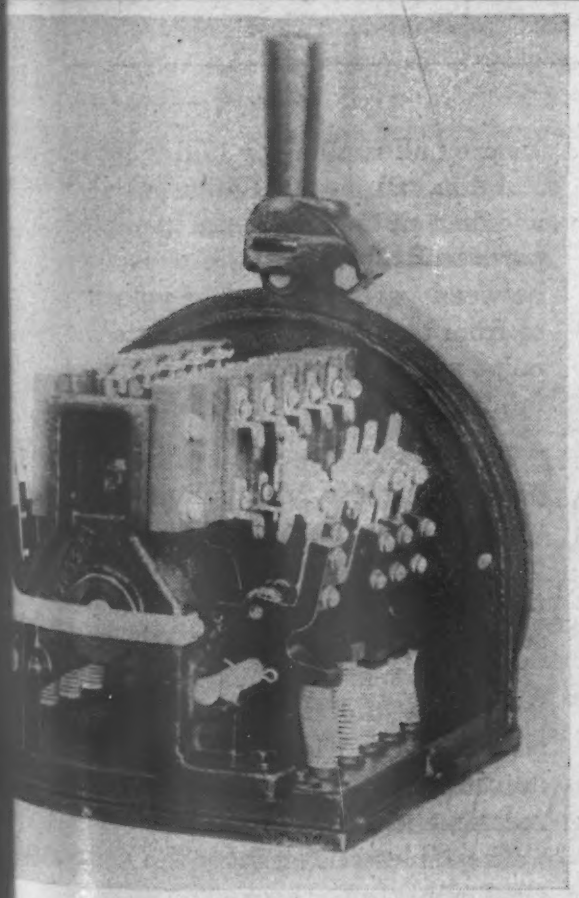

FIGURE 2. Rear view of a cam-type switch, with cover removed to show operating parts

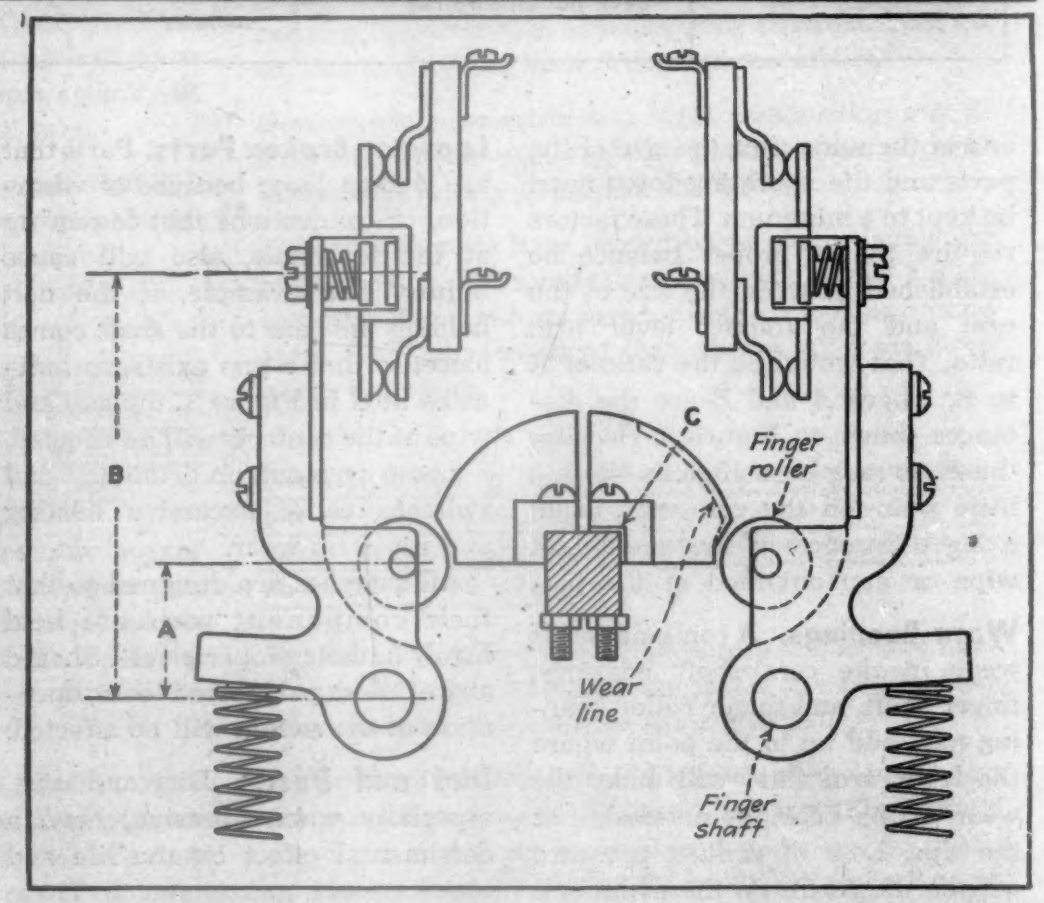

FIGURE 3. This diagram shows the operating principle of cam-type master switches. Opening and closing of contacts is controlled by cams on which contact fingers ride

WHAT TO CHECK ON INSPECTION

PART	CHECK FIRST (All three types of switches)	CAM-TYPE SWITCH	DRUM AND DIAL SWITCHES
CONTACTS	Wipe, gap, and contact pressure. Compare with other similar contacts, or obtain data from manufacturer	If of precious-metal type, see that base metal does not show through. Do not file or otherwise remove contact material	Remove grooves and sharp projections with fine file. Lubricate with thin film of petroleum jelly
POSITIONING DEVICE	Make sure that operating points are clearly felt. Must be tight enough to prevent handle from rotating or fall- to the on position by gravity		

HOW TO LOCATE TROUBLE

TROUBLE	CHECK FIRST	CAM-TYPE SWITCH	DRUM AND DIAL SWITCHES
IMPROPER WIPE, GAP, AND CONTACT PRESSURE	Look for wear on contacts. Replace if necessary	Condition of cams and bearings. Check cam location and tightness of cam on shaft. Check springs	Check bearings and springs. See whether finger board is loose
CAMS WORN		Check alignment. See whether roller turns	
SHORT CONTACT LIFE	Check current, if one particular tip gives trouble	Check wipe and gap. Spring must not be solid with contacts closed	Check contact pressure and drop. Lubricate with thin film of petroleum jelly
BEARINGS WORN	Replace if necessary. Note manufacturer's recommendation relative to lubrication	Put light oil on finger roller	
DUST AND DIRT	Make sure that cover has been put on correctly	See whether finger rollers turn. Remove dust from contacts	Remove dust from contacts

and at the same time the size of the parts and the operating force must be kept to a minimum. These factors require that a proper balance be established between the size of the cam and the contact lever arm ratio. That would be the ratio of *A* to *B*, where *A* and *B* are the distances shown in Figure 3. Because this ratio may be as high as 4 to 1, a little wear on the cam may make a big difference in the amount of wipe or gap obtained at the tips.

Worn Bearings. A combination of wear in the cam shaft bearings, finger shaft, and finger roller bearing may add up to the point where the lever arm ratio will make the wear in the bearings noticeable at the tips. Loss of contact pressure will be the result on the drum and dial switches, causing heating of the tips and increased tip wear.

Loose or Broken Parts. Parts that are shaken loose because of vibration, or connections that loosen up at the terminals, also will cause failure. For example, if the bolt holding the cam to the shaft comes loose, so that a gap exists, as indicated at *C* in Figure 3, the gap and wipe at the contacts will be affected.

Loose segments in drum and dial switches cause excessive heating and rapid tip wear.

All switches are designed so that their component parts are held firmly in their proper places. Should any of these parts come loose, operation of the switch will be affected.

Dirt and Dust. Dirt and dust, especially when abrasive, have a detrimental effect on the life and operation of a master switch. These substances, as well as metal and oxide particles from the tips, cause wear on all rubbing or sliding parts.

Again, an accumulation of dirt and dust on the surfaces of insulated parts tends to reduce the resistance between parts of opposite polarity, or from the circuit to ground, to the point where short circuit results in failure.

Master switches are available in general-purpose, dustproof, and watertight enclosures. If dirt, dust, or moisture presents a problem, time and money can be saved by the selection of the proper enclosure.

To keep master switches in service, follow the manufacturer's instructions. Lubricate moving parts, adjust contact pressure to the value recommended.

The tables above show the principal points to be checked on inspection, and the procedures in locating usual causes of defective operation.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

We've already weathered a drop of 5 per cent or so in industrial production, and few people feel much the worse.

Over-all industrial output hit its post-war peak at 190 per cent of the 1935-39 average in March. Since then it's been slipping about 1 per cent a month.

The drop has been sizable in a few lines. Textiles are off 11 per cent; rubber, 15; alcoholic beverages, 33. But in most lines it's been a minor readjustment. Metalworking plants can't get enough sheet steel. Building materials manufacturers find demand easing a bit.

Plantwide vacations were a factor in July. Figures on industrial production haven't yet been adjusted to take them into account; if this were done, the over-all index would be slightly higher.

Department stores are buying actively again, so many soft-goods lines look for a pick-up in September. But exports hold the real key to the production outlook in the next few months. June exports were off 12 per cent from May. If this slump continues, it may pull total industrial production down 3 to 5 per cent by year's end.

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So far, lower production bogeys haven't affected employment. More than 60 million people held jobs during the summer. That's full employment in anyone's book.

But vacations were a factor here, too. Over 4 million jobholders were on vacation in July as against some 2 million in June. So the number of people actually at work dropped 2.5 million between June and July.

Big question now is whether industrial production will pick up enough in the fall to prevent some rise in unemployment rolls after vacationists return.

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Retail sales in dollars are still holding up well. People are bringing home bigger pay checks; total personal income ran to a stupendous annual rate of $193 billion in June. That's almost 12 per cent above a year ago.

Prices are up more than incomes, but there's no buyers' strike yet. Cost of living is 18 per cent above a year ago. Despite all talk of rising prices, however, over-all indexes have gone up only a few per cent in recent months. Prices seem higher because everyone thought they would be on the downgrade by now.

Soaring meat prices are, of course, no illusion. Agriculture Department experts hold out the hope of lower meat prices this fall. Reason is, the feed-grain shortage will drive more animals to market. But that will mean less meat, possibly higher prices, next year.

And the Agriculture Department also thinks higher prices for milk, cheese, potatoes, and eggs will offset the drop in meat. So don't count on smaller grocery bills for another few months at least.

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You'll have to wait a little longer for a new car. Back in March auto assembly lines ran at a clip that promised more than 5 million cars and trucks this year. But automakers ran out of sheet steel. And assembly lines have been moving by fits and starts ever since.

Through July, 2,720,000 cars and trucks had rolled off assembly lines. At that rate the year's total would run to 4,650,000. But automakers doubt that they will get enough steel even for this reduced goal.

Biggest reason why sheet steel is still so tight is that new sheet mills aren't rolling yet. But demand for sheet is also bigger than expected.

For one thing, small producers of sheet-steel products have been getting more than their pre-war share; they buy from warehouses and escape steel-mill quotas.

What is more, exports are a bigger factor than you'd think. According to the official figures, only 8 or 9 per cent of our steel is going abroad. But if you add in the steel contained in the freight cars, machinery, and other products that are going abroad, you see that about 20 per cent of our steel is actually being exported. That's a big factor in holding back automobile assemblies.

Government economists now think construction will be a little above last year. But they point out that physical volume will be only 10 per cent above 1939.

Construction costs have leveled off at about double the pre-war figure. More and more people who put off buying last spring because costs were too high are looking around again. They are convinced that costs won't come down at any time soon.

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Don't be misled by those who say the recession has been put off indefinitely. Their argument runs like this: because the much-advertised slump hasn't come yet, there's no longer any danger.

But this flies in the face of all experience. Booms have always led to slumps. And the higher the booms have gone, the harder has been the subsequent fall.

It's perfectly possible to avoid a severe slump in the next few years if we keep our heads up. But it will be a tricky job of the sort that's never been done before. So this is no time to throw caution to the winds and embark on an inflationary binge.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Heaviest union fire on the Taft-Hartley Law is aimed at: (1) Ban on political expenditures; (2) suits for breach of contract.

1. Both CIO and AFL openly defy the politics ban, invite test of constitutionality. *CIO News,* in 1948 "Voting Guide," urges defeat of legislators who voted contrary to CIO wishes. Senators are scored as voting "right" or "wrong" on 10 issues. They range from the Taft-Hartley Law to taxes, rent control, Bilbo, Lilienthal.

Congressmen are tested on 12 roll calls, including Labor Department appropriations, poll taxes, home loans for GI's.

CIO's Philip Murray taunts Congress by urging election of labor favorites in special congressional elections in Baltimore and Pittsburgh. At the same time, CIO oil workers kick in to campaign fund of Texas candidate.

In Connecticut, the AFL, in a paid newspaper ad, asks defeat of a congressman who voted for the new labor law.

Incidents of this kind will build into crisis next year. That's when we elect a President and new Congress. Senator Ball's joint "watch-dog" committee to study the new law will get into the situation. Chances for some modification are good. Political comment in union newspapers may be permitted, no matter how financed. But no outright money contributions. Meantime, Justice Department moves cautiously on prosecution.

2. Ford has put off for a year a showdown with CIO's auto workers on union freedom from financial liability. Not so Murray Corporation and International Harvester.

Both these companies settled with UAW-CIO on this basis: Union is not to blame for wildcat strikes it can't control. It assumes obligation to try to end any such strikes or slowdowns. If it fails, discipline of individual strikers is left to management. Those disciplined may appeal to contract grievance machinery.

This principle of absolving union from blame but giving management the disciplinary weapon has been adopted by other companies and unions. They include Curtiss-Wright and UAW-CIO; Scovill Manufacturing and Mine, Mill, & Smelter Workers.

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Truman doesn't like Congress telling NLRB how to interpret the new labor law. So, he has put Members Gray and Murdock and General Counsel Denham on the spot. They're interim appointees, must be reappointed and confirmed next January.

Truman told NLRB to make up its own mind, not run to Ball's "watch-dog" committee for guidance. Since this committee wants to give guidance, it is faced with a Presidential challenge, leaving the appointees in a dilemma.

If Gray, Murdock, and Denham don't please Truman, he may not reappoint them in January. If they do, and he does, the Senate labor committee might not confirm them.

You can write off chances of AFL-CIO merger. They're dead for a year, at least. Likely longer. For this, the Taft-Hartley Law gets an assist. It's partly to blame, not wholly.

For, it seems, this law has not stirred organized labor to unite in self defense, as many thought it would. Not yet. Instead, it has widened the breach in labor ranks. CIO's Murray and AFL's Green throw in the sponge, blame each other.

Obstacles to healing the rift sift down to two:

1. Clash of personalities, ideologies, and jurisdictional domains. Green, Lewis, Murray, Hutcheson, Tobin, Reuther, Communists, anti-Communists, the politically ambitious. They don't seem to blend.

2. Different approaches to the Taft-Hartley Act. CIO doesn't want to touch it. It embarrasses Communist union officials. AFL, on the other hand, sees it as a useful weapon against CIO.

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Straw in the wind? New York State AFL endorses George Meany for AFL presidency. *If Green resigns.* The secretary-treasurer is in a good spot to move up from. But he'll have to contend with John L. Lewis. Odds are on Green sticking.

AFL convention opens October 6 in San Francisco. Political plans for '48 will get headline attention. Republicans have lost some AFL support. Gompers' philosophy of "help your friends and punish your enemies" may be carried into action through a political group paralleling CIO's Political Action Committee.

CIO convention begins a week later in Atlantic City. Thus, AFL and CIO will compete for headlines, public favor. For this reason, much of the shouting may be discounted as pure union politics.

After castigating Congress and condemning the Taft-Hartley Law, the CIO conclave will wrestle with an internal problem it has long ducked. A stronger stand will be taken against Communists than last year's simple declaration of resentment against Communist "interference."

Organized labor is involved in at least four congressional committee investigations. They cover musicians, food handling, building trades, Communism.

EX-UNION MEMBER: Rep. Homer A. Ramey (R., Ohio), expelled by Toledo local of AFL City Employees Union for voting for the Taft-Hartley Law.

ADMISSION: By Dan Tobin, teamsters' chief, that unions "invited" the new law by labor abuses.

CHAIRMAN GIVES FOREMEN BASIC ECONOMIC FACTS

ALDUS C. HIGGINS • CHAIRMAN, EXECUTIVE COMMITTEE
THE NORTON COMPANY, WORCESTER, MASS.

FACTORY *has said many, many times that management must transmit basic economic facts to supervisors and other members of the working force. Here, in line with that thinking, and to illustrate how industry is doing the job, the editors present the text of an actual talk to foremen*

In the early days of business in this country, the corporation did not exist. Individuals or partnerships owned and controlled business enterprises. But as wealth increased, and business, especially the manufacturing industry, increased, there arose a demand for an industrial organization less dependent on the life, health, and enterprise of individuals. As manufacturing became more complicated, it required the talents of more than one or two men. Then those who made money wanted to invest it, and from this and other demands, the stock company with limited liability grew.

The corporation was originally established to earn money for its stockholders; that was almost its sole obligation. The early corporations were closely held by a few stockholders. The business owned by an individual or a partnership was usually small, with few employees who were known personally by the owners. Apprentices were often treated as members of the owner's family, and the employees as partners. In good times they shared in the earnings, and in bad times they worked for little or nothing.

This same employer-employee relationship often continued when the business was run as a corporation, especially when its stock was closely held. But as business grew larger and required more money, stock was sold to those whose only interest in the business was that of investors, and as the original owners died and new managers came in, the human relations between management and labor were often neglected. Management was elected and paid by the stockholders to make money for them, and its obligations were supposed to end there.

Labor a Commodity

With this sole obligation in mind, management acquired great power. No longer was labor treated as a partner. It was treated as a commodity, bought as cheaply as possible, worked long hours under poor conditions, and child labor was common. With the money it made, it did not hesitate to crush competition by unfair means.

While all of these things might have been and sometimes were done by selfish individuals and partnerships, the corporation form of business made such practices more impersonal and more common. Personal responsibility was easy to avoid. The corporation, a legal entity, was not supposed to be responsible for human relations. This led to the general feeling that corporations were soulless and without conscience.

Such a condition was the fault of the men who managed the corporations, and not the fault of the corporation as an institution. It might have happened under any other system or concentration of power. . .

The corporation as a system did a wonderful job of developing industry in this country, but as it acquired power, it became tyrannical and had to be brought under control. . .

To be free one must assume obligations. Free enterprise becomes ruthless power unless ethical obligations to others are accepted. These obligations include those to employees, to customers, to the community, to the country, and only finally to the stockholders. Now the rules have been laid down, and we have anti-trust laws, child labor laws, social security laws, fair practice laws, and wage and hour laws.

These laws did not change the obligations already recognized by The Norton Company. We had lived up to a tradition which came down from our founders—that our employees are our first consideration. They have been treated as nearly like partners as possible under modern industrial conditions. The corporation's directors and officers have believed that employees should enjoy a high standard of living, that management should be vigilant and prompt to rectify just grievances, and maintain satisfactory wage scales. . . Our management is interested in employees' health and in their outside interests. It believes in social security, retirement income, and insurance against sickness, accident, and death.

This company, and the way it is run, expresses our idea of the obligations of the corporation. We believe that if a corporation is maintained with these purposes and ideals, it is the best means of conducting the system of free enterprise. We believe that the free enterprise system should be run with conscience, that directors should be trustees under obligation

not only to stockholders, but to American democracy. . .

The following questions have been asked of me:

How much profit should a business earn?

Enough to meet its obligations to its employees with a scale of wages sufficient to maintain a fair standard of living, and set up to recognize merit and value in accord with the ability and efficiency of each employee. It should have profit enough to contribute to social security, insurance of all kinds, and retirement income for all its people, to employees' organizations, and to interests affecting employee welfare. It should earn enough to take an influential part in the community, to contribute to civic organizations and enterprises. It should earn enough to replace obsolete plants and equipment, to grow with industry, to lay aside something to be used to maintain the organization during hard times. And, finally, it should earn enough to pay stockholders a fair amount of return on their investment.

Profit is essential to the security of a business. A record of sound earnings over a period of years is a guarantee of jobs. There are a good many false statements regarding profits. It is frequently said that "corporations are making huge profits which they could use to increase wages." The truth is that if *all* corporation profits were used for wages, wages could be increased only 4 per cent. . .

What are the advantages of expanding into foreign countries? Is it good Americanism?

We put our foreign plants in countries where, because of tariffs or other trade restrictions, or because of cheap labor, our American goods were driven out. Each of them in peacetimes has been profitable, and these profits have enabled us to meet demands here for wages, improvements, and increases in plants. From our Niagara Falls plant, for instance, we furnish alundum and crystolon abrasives at a profit to us here. We furnish grinding wheel bonds, special wheels, and a large part of the special machinery. We believe that we have more jobs and more profitable business because of these foreign plants. . .

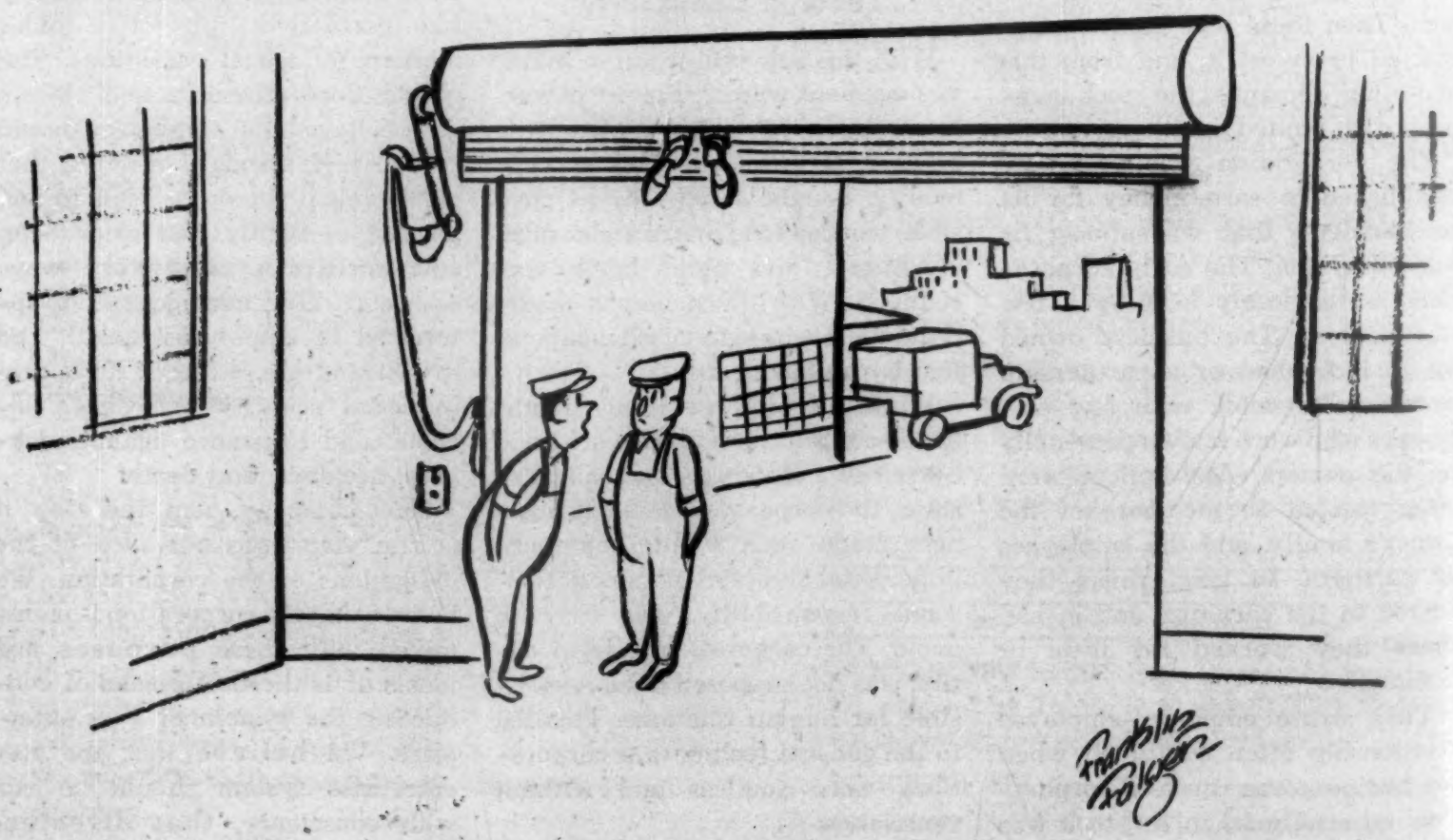
What is the future of the corporation in the United States?

The future of the corporation and free enterprise depends on *people*, on men and women engaged in management and production. It depends on the conscience and patriotism of leaders—in management and labor as well as in government. It depends on stockholders electing leaders who will understand their human responsibilities. . .

What is the future of the free enterprise system with government exercising more and more control over business?

I am not really afraid that corporations will be overcontrolled by laws or by labor if they are left to be run by private enterprise. Whatever rules are passed by the people's government, we can live up to. . .

The survival of the free enterprise system and the corporation and even our democracy depends upon the recognition by all the people, including management and labor, of the obligation of every American citizen. The corporation must acknowledge that it is duty bound to maintain a human soul. Management must have a conscience. Labor must recognize the rights of others. Investors must be satisfied to pay their share of profits to the general good. These obligations are being recognized by more and more corporations.



"HE WAS HERE WHEN I OPENED UP THIS MORNING"

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

CENTRAL CLOAKROOMS SAVE TIME, INSURE SAFETY

GEORGE J. LAMBERT, Personnel Director, Galvin Manufacturing Corporation, Chicago

Central cloakrooms where employees check their wraps and personal belongings serve a threefold purpose at our plant. They guarantee the safety of the articles (the company insures all personal property checked), they keep the garments in an orderly manner so that they do not clutter up the plant, and they eliminate the practice of getting ready to leave before the bell rings—cloakroom attendants do not issue garments before closing time unless a special pass is presented. Clothing is checked before the shift begins, and re-issued after closing, thus a great deal of productive time is saved.

Three cloakrooms serve the employees; one at the main entrance accommodates 1000, and the other two handle 800 and 600 each. Eight attendants in each cloakroom assure prompt attention, and shifts are staggered so that the employees arrive and leave in groups of 100 at 15-min. intervals.

Cloakrooms are serviced by employees who come in early at the beginning of each shift and leave early to compensate for their "early time." Numbers clearly printed at the end of each coat rack show where the garments on each ticket are located, thus eliminating the confusion involved by getting in the wrong line.

A definite maintenance schedule for the cloakrooms is followed. The regular maintenance department disinfects them once a week, and an outside contractor is brought in once every three months. In this way, absolute cleanliness is maintained to prevent contamination of any articles checked.

Cloakrooms near the three employee entrances allow workers to check their wraps and personal belongings, which eliminates losses, maintains neatness in the plant, and saves production time

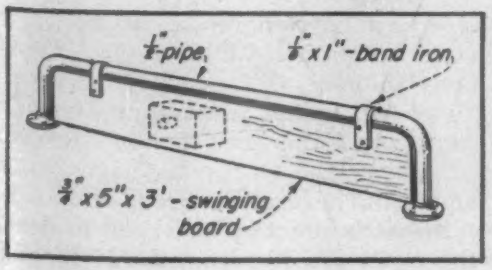
EMERGENCY STOP SWITCHES OPERATED BY FOOT

RALPH MORIN, Maintenance Superintendent, Boston Gear Works, Quincy, Mass.

Emergency stop switches, actuated by a touch of the foot, have been developed at the Boston Gear Works as safety device. They are used on all machines rotating at high speeds where the object being worked on has to be held by hand, or where there is danger of the piece coming loose.

For example, on a high-speed wood lathe, a normally closed switch, mounted near the floor, is actuated by a board 3 feet long by 5 inches wide. This board is suspended loosely on a bent section of ½-in. pipe screwed to the floor. In case of emergency, a touch of the operator's foot on the board pushes it against the normally closed pushbutton station located directly behind it, which immediately cuts off the current.

In the event that a split-second stop is required to cope with an emergency situation, this type of switch is particularly effective, since it leaves both hands free to control the material and the machine.



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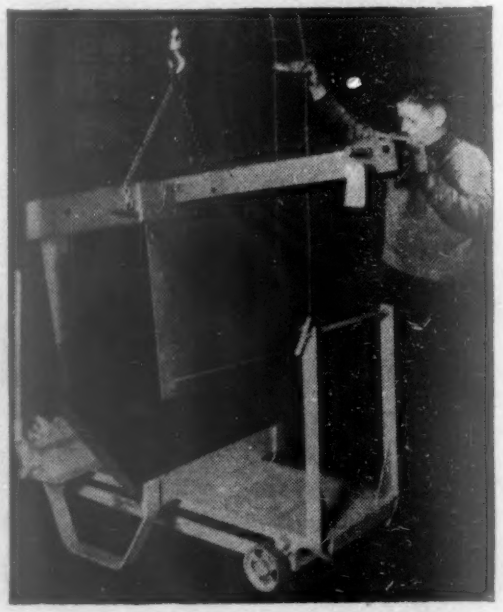
Bimonthly plant dinners for employees and their wives and husbands are sponsored by the Cudahy Packing Company, Kansas City, for the purpose of familiarizing them with the various plant activities. Movies are shown, and company officials discuss proposed work, policy plans, pay check changes that affect the workers. Cudahy wants families to appreciate the importance of the workers' activities, and to be familiar with their duties

SPECIAL HAND TRUCK FOR AWKWARD LOADS

Hand truck and skid have been combined in the Yale & Towne Philadelphia plant to make a materials handling unit for carrying odd-shaped frames.

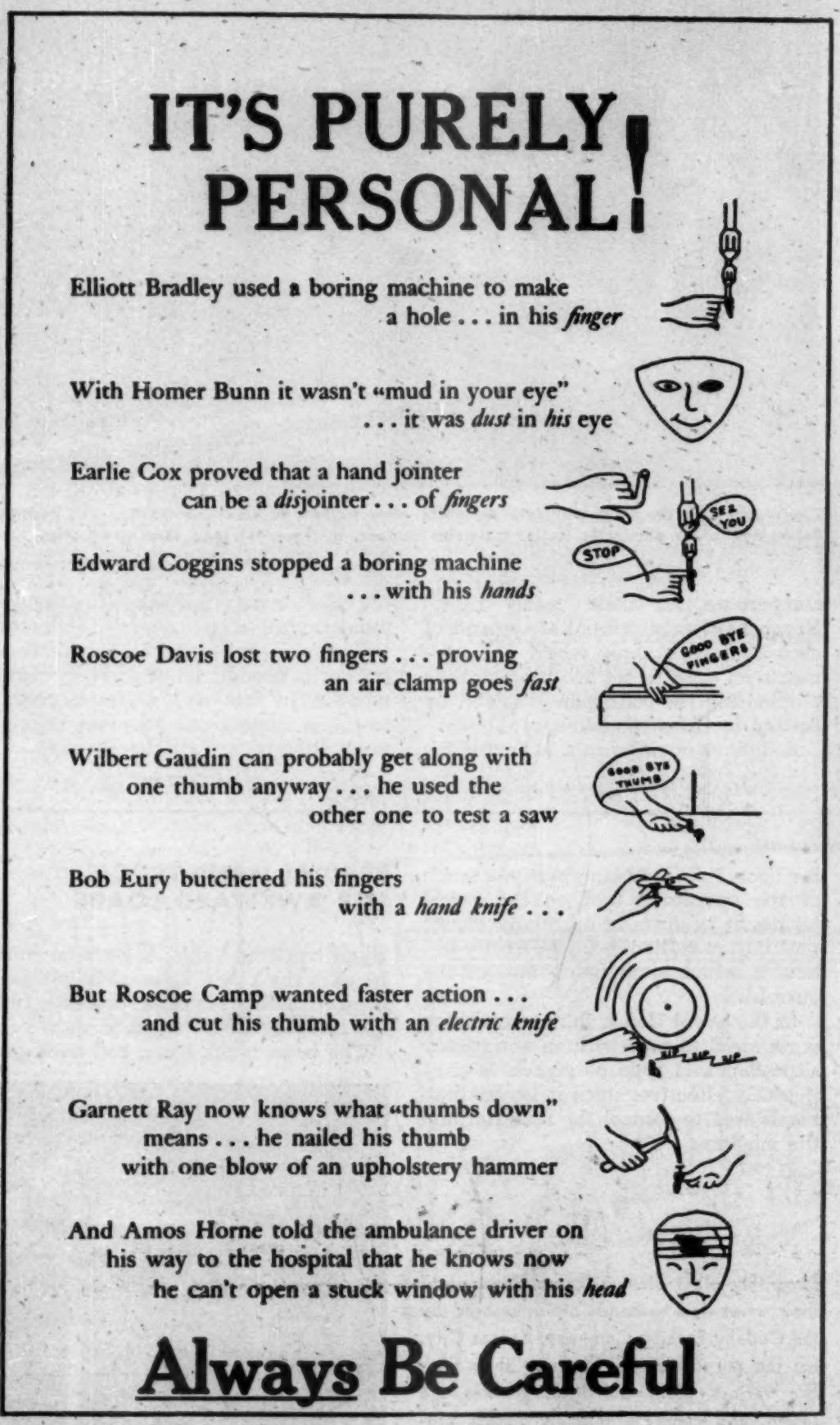
The basic truck has a full deck and



rail handle. To this, heavy steel skid legs have been welded to structural angles secured abeam of the deck. An end rack has also been added by welding vertical steel flats to the corners of the open end of the deck. Holes have been drilled into the upper ends of these flats to provide means of securing a removable bar.

When the deck is down, the skid legs rest on the floor, and act as a truck brake. When the deck is raised (by a foot lever), the truck and its load can be pushed to desired locations.

By positioning the angles to fit the contours of an awkward load, and by installing a removable bar at a height convenient to support the overhang of the load, all danger of the work sliding or falling is eliminated.


IT'S PURELY PERSONAL!
Elliott Bradley used a boring machine to make a hole . . . in his *finger*
With Homer Bunn it wasn't "mud in your eye" . . . it was *dust* in *his* eye
Earlie Cox proved that a hand jointer can be a *dis*jointer . . . of *fingers*
SEE YOU
Edward Coggins stopped a boring machine . . . with his *hands*
STOP
Roscoe Davis lost two fingers . . . proving an air clamp goes *fast*
GOOD BYE FINGERS
Wilbert Gaudin can probably get along with one thumb anyway . . . he used the other one to test a saw
GOOD BYE THUMB
Bob Eury butchered his fingers with a *hand knife* . . .
But Roscoe Camp wanted faster action . . . and cut his thumb with an *electric knife*
Garnett Ray now knows what "thumbs down" means . . . he nailed his thumb with one blow of an upholstery hammer
And Amos Horne told the ambulance driver on his way to the hospital that he knows now he can't open a stuck window with his *head*
Always Be Careful

Driving the safety lesson home by depicting the unpleasant experiences of some of its own employees, has proved an effective method of accident prevention at Tomlinson of High Point, Inc., High Point, N. C. Clever copy on 12x22-in. posters tells in large black type of ten prominent accidents, naming names and citing cases. "Here's How" sketches, highlighted with red splotches where the blood flowed, illustrate the posters

SECTIONAL DIP TANKS SPEED PRODUCTION

Movable paint tanks, made in sections, have done a great deal to speed up production at Lyon Metal Products, Inc., Aurora, Ill. These dip tanks are mounted on wheels and run on rails, so that they may be moved easily along the production line.

Tanks are two stories deep; the upper portion opens directly onto the production floor level where the dipping process takes place. The lower part, where the controls are, opens onto the floor below.

A different color can be kept in each of the sections, and when a new color is needed, one of the sections can be emptied, flushed out, and filled with the new paint from the lower level while the dipping process in one of the other sections continues normally on the production floor above.

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Metal grate floor prevents carbon powder, some of which settles to the floor, from being tracked away from the spray booth to other areas of the RCA Tube Department, Lancaster, Pa. Formerly a major problem for the maintenance department floor cleaners, the carbon deposits now drop through the grate. Simplified floor care in areas has more than paid for the cost of the grates

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AIR COMPRESSOR COOLING WATER SALVAGED

Re-use of air compressor cooling water at The Monarch Machine Tool Company, Sidney, Ohio, has reduced the water bill of the plant approximately 50 per cent. This is quite a considerable sum, since the total quarterly savings amount to several hundreds of dollars.

Previous practice had been to draw the water directly from the 35-lb. city

supply and discharge it into the sewer in a 2-in. stream.

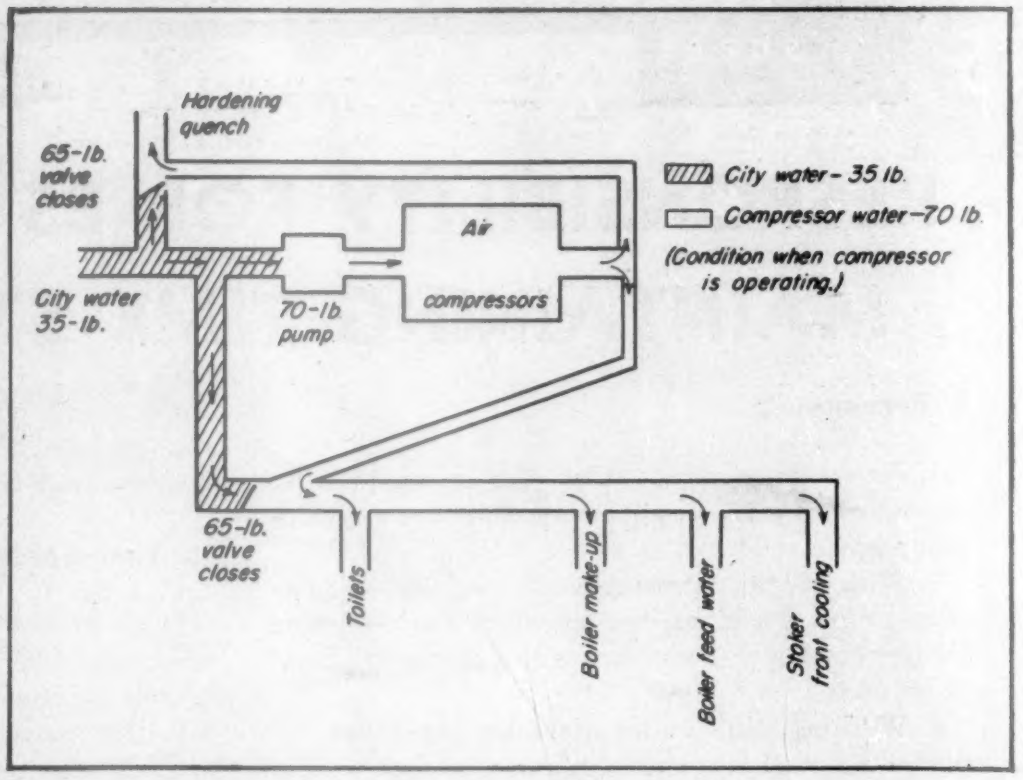
The first problem in attempting to salvage this water was to determine where else in the plant such a large amount could be most effectively used. After some study, it was found that there were four possibilities: (1) For boiler feed water; (2) in the boiler room as make-up water; (3) in the flushing of toilets; and (4) as cooling water for the stoker fronts.

However, since the air compressors are not in continuous operation, it meant that when they were not functioning the discharged water supplied to these other points would still have to be supplemented with water from the city mains. Also, it required stepping up the pressure in the water used for cooling the compressors.

To obtain the higher operating pressure required, a 1½-in., 500-gal. per-hour centrifugal pump was placed on the water line just before it made connection to the air compressors. Driven by a 3-hp. motor, this pump maintains a pressure of between 65 and 70 pounds in the discharge line, while the compressors are operating. A cutoff valve, inserted in the line as indicated in the accompanying sketch, prevents pumping the condenser coolant back into the city mains. When less water is required at the end-use points than is available, the surplus is discharged to the storm sewers through back-pressure valves set to open at 65 pounds.

Another use has recently developed for this higher-pressure water which easily eclipses the others in potential savings to the company. Monarch has for several years flame-hardened all its lathe beds, but has sometimes found that where one would be uniformly hardened throughout its length, another would fail to pass inspection because the heat-treatment appeared to vary in spots.

The trouble was traced to the fluctuation in pressure of the city water used for spray-quenching the beds. By substituting the salvaged water, whose pressure for spray purposes was stabilized by cutting back slightly on the discharge valve at the centrifugal pump, and feeding the sprays from a 1-in. line, the fluctuations in hardness of the lathe beds disappeared, and rejections on this score have been completely eliminated.



ENDLESS CHAIN DRAWS LOADED TRUCKS UP RAMP

An electrically driven endless chain has been installed at the distribution depot of Messrs. S.P.D., Ltd., near Cambridge, England, according to *Mechanical Handling*, London, to draw heavily loaded hand trucks up an inclined ramp. Two dogs are attached to the chain, which runs the length of ramp.

After loading his truck, the operator merely runs his truck over to the ramp, places it over the lower end of the chain, and presses the pushbutton starter with his foot. The dogs on the chain engage the front or main axle of the truck, and take it up the ramp. The operator just has to guide it.

Another improvement on the descending side of the ramp is the braking action achieved by the use of a long wooden rail running the length of the down-side. This rail is attached to the ramp by a spring at each end, and by wheeling the truck over it, the speed of the descending carrier is controlled.

Heavy loads may easily be carried up this ramp (left) by the use of an endless chain, with dogs which hook under the main axle of the hand truck. On the descent (right), a long rail, attached by springs to the ramp, over which the truck is driven, brakes its speed

management data sheet 15

RESPONSIBILITY FOR ESTABLISHING, MAINTAINING TIME STANDARDS

I. Foreman

1. He makes certain that the manufacturing methods and processes are correct before any further steps are taken.

2. With the aid of members of the staff, he provides proper machines, equipment, or work-stations for performing the work according to the methods to be used.

3. Working with the maintenance supervisor, he places the machines and equipment in such a state that they are capable of producing work in accordance with manufacturing specifications.

4. Cooperating with the tool supervisor and the time study department, he checks the tooling for the machines and equipment to determine whether it is proper for performing the operations.

5. He mans the machines and work-stations with qualified operatives.

6. He makes sure that operatives who are to be studied have ability within the range of the leveling procedure for skill; that they have mechanical ability, dexterity, and muscular coordination according to the requirements of the work.

7. He explains to the operatives any changes in design, methods, tooling, manufacturing specifications, and tolerances which are to be used during the studies.

8. He tells operatives why studies are to be taken, also what use is to be made of the data.

9. If it is the authorized procedure, he informs the union representative for the department that the studies are to be taken and why.

10. He makes certain that the operatives are willing to be studied.

11. Working with representatives of the staff departments, he sees that complete manufacturing information is available to the operatives and all others who may require it.

12. While studies are being taken, he checks with the time study man and assures himself that the performances of the operatives are within the range of the leveling procedure for effort.

13. He reviews the results of the studies with the time study man and learns all unusual conditions that influenced the studies.

14. After the standards have been established, he follows methods, specifications, and conditions which affect time standards for all the work in his department. When changes are made, he notifies the time study department so that necessary modifications may be made in the time standards.

II. Time Study Man

1. He makes comprehensive analyses of all possible methods for performing the operations and arrives at one best suited to all conditions to be met. He considers the quantities to be produced, available equipment, cost of tooling and set-ups, etc.

2. To the foreman, and to other members of the organization from whom action is required, he furnishes complete detailed analyses of the proposed methods and process for performing the operations.

3. He consults with the foreman while the latter studies the proposed methods to determine the action to be taken.

4. He aids the foreman and staff departments in planning the work schedules for the correct machines, equipment, or work-stations.

5. He aids the foreman, manufacturing engineer, and tool supervisor in providing proper tooling for the machines, equipment, or work-stations.

6. He helps the foreman select operatives to be studied for establishing time standards.

7. He makes certain that all conditions are right for the time studies.

8. He secures all time study equipment required for taking the studies.

9. He is careful to cooperate with the foreman in dealing with the operatives. He studies them until he knows the proper approach in dealing with them.

10. He breaks down the operations into their proper elements for timing.

11. He times the elements accurately as they are performed, recording all foreign or irrelevant operations and delays.

12. He carefully and justly evaluates the performance of the operatives and records his leveling for skill and effort. He notes the conditions under which studies were taken.

13. He asks the quality control representative to check the work produced during the study for quality and quantity.

14. Where there is a possibility of dispute as to the quality of work produced during the study, he secures the aid of the quality control representative in making a permanent record of the

Prepared by G. Z. Wollam, Assistant to Vice-President, Westinghouse Electric Corporation, Jersey City, N. J.

CONTINUED ON PAGE 136

YALE FORK TRUCK

DEPENDABLE

POWER

EXIDE-IRONCLAD POWER
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They're saving time and cutting costs on materials handling jobs like yours

More and more companies, with operating conditions that closely parallel yours, have discovered the way to faster, safer and more economical handling of materials. They have given the job of lifting, hauling and stacking to the efficient battery electric truck and equally efficient Exide-Ironclad Batteries.

The high electrical efficiency of Exide-Ironclad Batteries is due largely to the unique construction of the positive plates. Each of these plates consists of a series of grooved hollow tubes which contain the active material. So fine are these slots that, while they permit easy access of the electrolyte, they prevent the active material from readily washing out. Not only does this add to life of plates . . . and battery . . . it also provides higher power ability and capacity, assuring dependable, day long performance with maximum safety and minimum maintenance.

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YALE WORKSAVER

RESPONSIBILTY FOR ESTABLISHING, MAINTAINING TIME STANDARDS

CONTINUED FROM PAGE 134

quality of work deemed acceptable at the time of the study. If the study is particularly important he asks the quality control representative to sign the study indicating that the work produced during the study was within manufacturing specifications.

15. He makes his calculations and works up his studies according to standard procedure, leveling the operatives according to his evaluation during the studies.

16. He describes fully the parts on which the operations were performed and usually makes sketches of them on his observation sheets.

17. He makes permanent records of machines and equipment used, also all dies, jigs, fixtures, and tooling employed.

18. He reviews the studies with the time study supervisor to determine if the study is acceptable, based on feeds, speeds, and cuts, leveling, etc., or if a new study will be required.

19. He then reviews the study with the foreman and informs him of any unusual conditions.

20. He tells the respective operatives the results of the studies.

21. After time standards have been established, he follows the operations to determine whether the operatives are making out well on the values.

22. He maintains a constant vigilance for any changes in design, tools, equipment, material, specifications, methods, or conditions that would affect time standards.

23. He restudies the operations promptly as changes are discovered or reported, and revises time standards where the changes are significant.

III. Equipment Engineer

1. He provides data for use by the foreman, manufacturing engineer, and time study man in selecting the equipment and machine tools which will best perform the operation specified.

2. He determines what operations the machines are capable of performing, also their capacities and limitations.

3. He often arranges demonstrations and makes tests to prove suppliers' claims for their equipment.

4. He keeps in constant touch with the latest developments so that the most modern and best adapted machines and equipment may be used.

IV. Tool Supervisor

1. He works with the foreman and time study man in planning dies, jigs, fixtures, cutting tools, and hand tools. He cooperates to make the tooling as effective as possible in accordance with the planned methods for performing the operations.

2. He designs tools for the most economical methods that will produce parts within the manufacturing specifications.

3. He notifies the time study man of all modifications in tools or tooling, which might change the methods or the labor content of the operations, so the latter can determine whether changes in time standards are justified.

V. Quality Control Man

1. He assures himself that manufacturing tolerances and process specifications are correct, also that they are clearly defined and well understood by the operatives, foreman, tool supervisor, and time study man.

2. He inspects material on which the operations are to be performed during the studies. He makes certain that it is of proper quality and consistent with that which will be received in the future.

3. He determines whether the pieces produced during the studies are within the manufacturing specifications and meet all requirements.

4. On important studies he signs the observation sheets when requested by the time study man, signifying that the material produced during the studies was according to specifications.

5. Where there is a possibility of dispute, in the future, regarding the quality required at the time of the studies, he aids the time study man in making a permanent record of the quality of work produced. This is particularly important in the case of machined surface finishes.

6. He notifies the time study department promptly of any changes in specifications or tolerances so that investigations may be made as to their effect on time standards.

VI. Production Planning and Scheduling Man

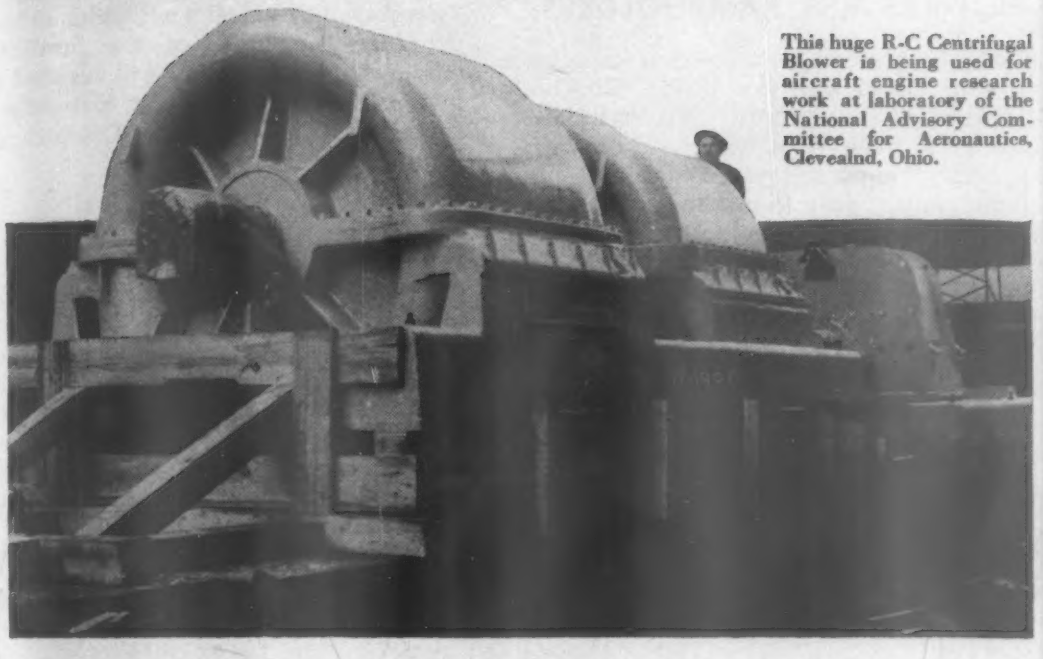
1. He provides an adequate supply of material for complete studies. He submits the material to the quality control department for the determination of its quality before the studies are started. The material should be consistent with that which will be received in the future.

2. He aids the foreman in securing complete manufacturing information for the operations.

3. He notifies the foreman and the time study man promptly of any known changes in design, tools, routings, methods, tolerances, specifications, or conditions which might affect time standards.

Prepared by G. Z. Wollam, Assistant to Vice-President, Westinghouse Electric Corporation, Jersey City, N. J.

Freight car loaded with WIND



This huge R-C Centrifugal Blower is being used for aircraft engine research work at laboratory of the National Advisory Committee for Aeronautics, Clevealnd, Ohio.

This freight car packs hurricanes! It's loaded with a Roots-Connersville Centrifugal Blower that in just one minute can push the air out of a 10′ circular tunnel, 450 feet long. Or, it can blow a gentle breeze, too, if that's what is wanted.

Not all industrial blowers are that big. But whether they're big or little, Roots-Connersville builds them down to the small Rotary Positive units delivering only ten cubic feet per minute. With both Rotary and Centrifugal equipment to choose from, our engineers can recommend the size and type that will precisely match your requirements. That's R-C *dual-ability*.

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- Boosting gas system pressure
- Priming centrifugal pumps
- Transporting live fish
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LIQUID PUMPS____
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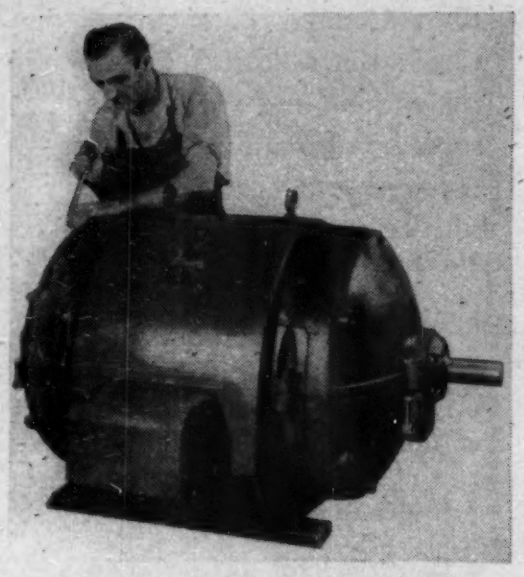
TITLE____

WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market

INDUCTION MOTOR

Constructed for high-speed use with boiler feed pumps, oil pipeline pumps, centrifugal pumps, compressors, and



blowers, a two-pole, squirrel-cage induction motor has from 200- to 700-hp. rating at 3600 r.p.m. Features include (1) Kolene process centrifugally cast bearing sleeves, (2) optional pressure-lubricated bearings, (3) split bearing brackets (doweled) permitting access to bearings, (4) windage noise lessened to avoid abrupt air acceleration, (5) phos-copper braze-welded cage winding. Electric Machinery Mfg. Co., Minneapolis 13.

FLOORING JACK

Holding boards in place for installing or repairing flooring, siding, and sheathing, Bord-Jak facilitates obtaining tight joints. Maker states it will handle tongue and grooved, square-faced, or warped lumber, allowing alignment without hammering or battering the wood. Jack

is anchored with a quick hammer blow, and broad pressure plate squeezes boards together, leaving hands free for nailing. Can be used in horizontal or vertical position. Spreading and squeezing joists or studs can be accomplished by means of accessory feet, which are a part of each tool. Maco Corp., Huntington, Ind.

FLUORESCENT LAMPHOLDERS

Two fluorescent lampholders, one for standard and one for 8¼-in. Circline lamps, are announced. The standard holder is made of a white plastic with a heavy reinforced section around the lamp contact area to eliminate cracking or breaking of the lampholder when the lamps are inserted or removed. Lamp insertion is simplified by a depressed slot finder. Three models are available—single lampholder, holder with black plastic starter socket, and holder with reversed plastic starter socket. The Circline holder, for use in portable lamps, consists of a white enameled channel with a plastic lampholder at one end and a plastic tension support at the other. It may be obtained with or without lamp switch and 30-in. leads. General Electric Co., 1285 Boston Ave., Bridgeport 2.

WINDOW CLIP

Non-corroding metal clip, for glazing Thermopane in steel sash, helps to hold in place the units of the insulating windowpane. The clips are supplied in lots of 500, with glazing instructions. Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo, Ohio.

STACKING PALLET

Multi-Stak pallet permits stacking loaded pallets with safety both to materials and to personnel, according to the manufacturer, and allows unevenly piled materials to be stored or transported without risk of sliding, tilting, or spilling. Each unit holds 4000 pounds, and has four supports on which succeed-

SMALL TRACTOR

Utility tractor, powered by a rugged gasoline engine, has three speeds forward and one reverse, and two power take-offs. Air-cooled 6-hp. engine has pressurized lubrication. An automatic clutch engages the engine at a predetermined speed, and avoids stalling. The tractor has all-steel welded frame, pivoted front axle suspension, and individual rear wheel brakes to facilitate turning. Weighing 750 pounds, it can be transported on a light truck. Salsbury Motors, Inc., 1201 East Lexington St., Pamona, Calif.

This special "Y" combines two 10-inch, standard weight, long radius welding elbows—TUBE-TURN Part No. 1, immediately available everywhere.
15" R
120° ± ½°

"A speedy, simple, satisfactory answer"

MANY'S the time when a long delay in getting a special fitting seems unavoidable. Many's the time when that fitting can be fabricated from TUBE-TURN Welding Fittings out of stock and give you the right answer—"speedy, simple, satisfactory."

The "Y" diagrammed above was put together with standard TUBE-TURN welding fittings, shown in Tube-Turn Catalog No. 111, and taken out of regular stock. This gave the designer what he needed when it was needed, in a hurry.

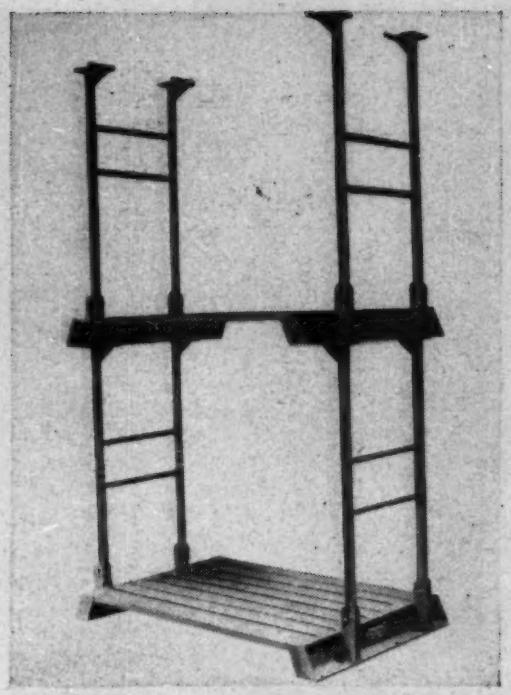
TUBE-TURN welding fittings are particularly suitable for piping fabrication because of the uniform wall thickness and full circularity which allows them to be cut and joined at odd angles, and because of uniformity from fitting to fitting. Order two, a hundred, or a thousand TUBE-TURN welding fittings of the same size and part number, and they will be dimensionally alike.

TUBE-TURN welding fittings and flanges are manufactured in more than 4000 types and sizes. They come in a wide variety of metals and alloys. For details, contact the nearest TUBE-TURN distributor. For his name, write to—

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY

District Offices at New York, Washington, D. C., Philadelphia, Pittsburgh, Detroit, Chicago, Houston, San Francisco, Los Angeles

TUBE-TURN TRADE MARK *Welding Fittings and Flanges*



ing pallets are piled and rigidly held in place. The supports are collapsible for compact storage in small space when pallets are not in use. Preventing crushing or fusing of materials through overpiling, the pallets permit capacity loads to be handled by a single hydraulic lift operation. Pallet Division, Industrial Washing Machine Corp., New Brunswick, N. J.

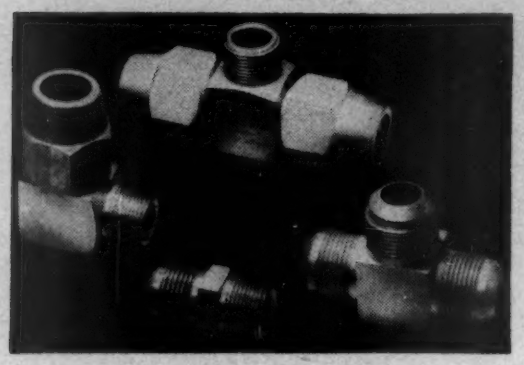
BOTTLE WATER COOLER

Suitable for use where plumbing connections are not available, or when spring water is preferred, Oasis Model OB-4 bottle-type water cooler serves 80 persons per hour, maker states. Unit has stainless steel, insulated and sealed storage tank; odorless-tasteless rubber bottle-gasket. Cabinet is heavy-gage

galvanized, bonderized steel. Lower front panel is removable for access to the condensing unit, and has perforated corner grills for cross-ventilation. Two holes in upper right panel permit mounting paper cup dispenser. The Ebco Manufacturing Co., Columbus, Ohio.

TUBE FITTINGS

Line of tube fittings is designed for heavy-duty or high-pressure applications. Made of steel and finished in



cadmium plate, the fittings are manufactured in sizes from ¼ to 1½ inches, and are available in straight, union, elbow, side tee, tube tee, and cross types, male and female. Flodar Corp., 331 Frankfort Ave., Cleveland.

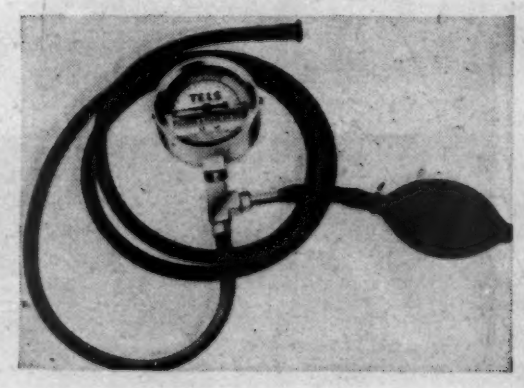
HEAVY-DUTY JACK

Capacity of 28-lb. Model 2510-A journal jack is 25 tons, height closed is 10 inches, and rise 5½ inches. The jack has

aluminum-alloy shell. Manufacturer says the ball-bearing action assures smooth raising and lowering, and positive control of the load. Buda Co., Harvey, Ill.

ENGINE LEAK DETECTOR

Indicating leaks in the cooling system of internal combustion engines, an instrument called Tels is adaptable for testing and blowing out fuel lines and needle valves, and for other purposes



which require low pressure. Designed to prevent overheating and loss of antifreeze, and to cut out-of-service time, it duplicates normal engine operating pressure at which most leaks become serious. Applying the proper test pressure, the maintenance man can quickly determine the location of the leak. Or, if there is no leak, he can spot the cause of overheating, or need for replacement parts. The instrument can be used on any type of liquid-cooled engine—gasoline or diesel, stationary or mobile. James Industries, Inc., 211 Municipal Bldg., Skaneateles, N. Y.

ILLUMINATED MAGNIFIER

Portable fluorescent-illuminated magnifier has 5-in. diameter double convex lenses. Single-lens Model PV2, for continuous use, has large field of vision and

moderate magnification. Double-lens Model PX2, for intermittent use, has smaller field of vision, and greater magnification. Indirect lighting is furnished by two 6-watt, 9-in. fluorescent daylight tubes. Unit plugs in any 115-volt, 60-cycle, a.c. outlet. Instruments for use on other voltages, cycles, or on d.c. can be supplied. Plastic-covered steel handle is attached to bracket supports. Lens holder may be tilted through full 360 degrees. Larrimore Sales Co., P. O. Box 1234, St. Louis 1.

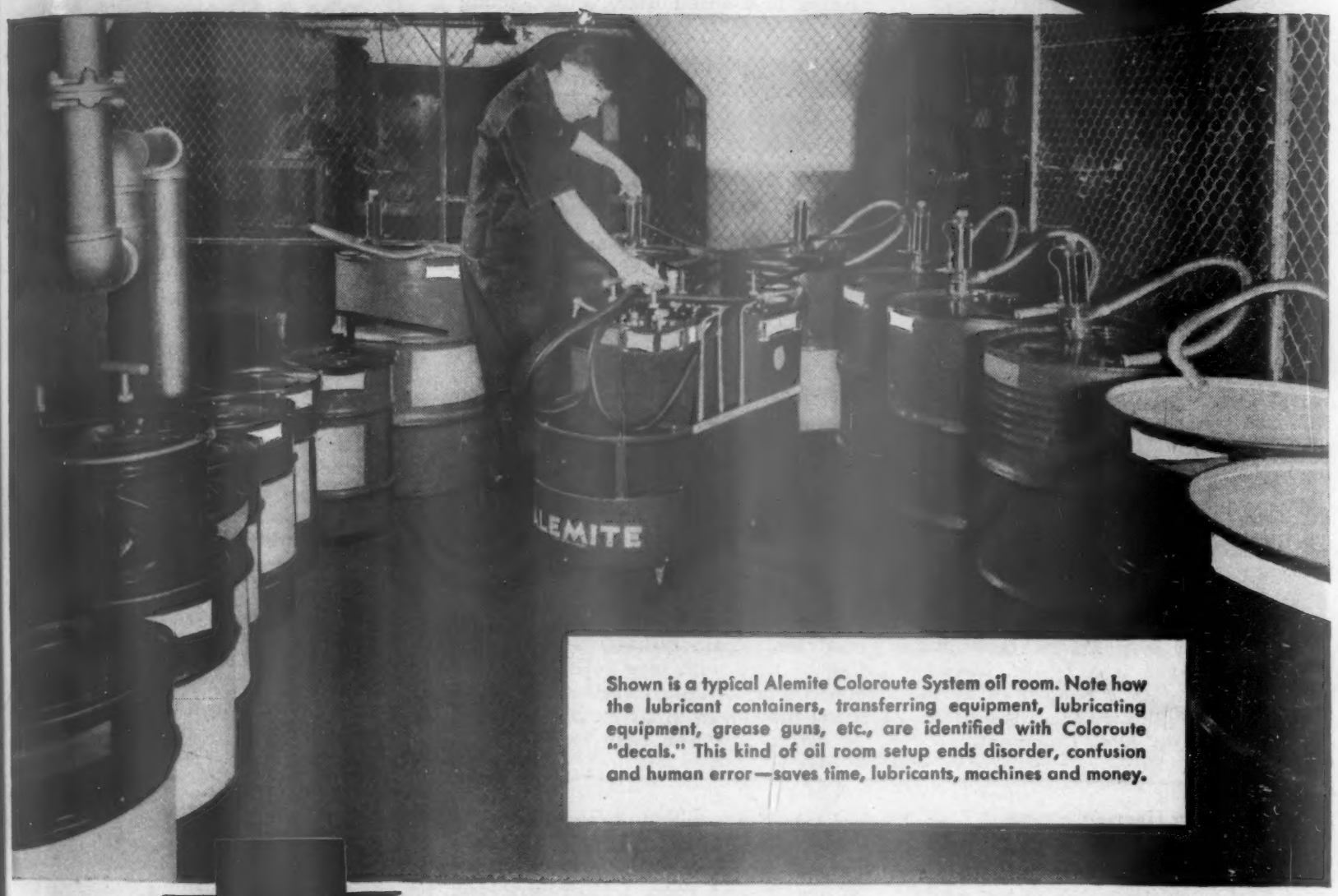
PENETRATING OIL

Los-Toy-Ol, maker states, is compounded to penetrate and prevent rust, to lubricate hoisting cables, to ease cylinder break-in, and to loosen tight nuts and other connections. It keeps oil and grease fluid at low temperatures, eliminates sticky valves, loosens sludge in crankcase, protects machine parts, and lubricates other equipment, it is claimed. Joseph Jurak Co., 39-09 65th Pl., Woodside, N. Y.

ELECTRIC CLEANERS

Powered with a 1⅓-hp. motor, a portable, heavy-duty cleaner weighing 14½ pounds blows air at a velocity of 25,500 f.p.m. A 9½-lb. medium-duty cleaner, with a ⅔-hp. motor, displaces air at 19,000 f.p.m. Both models have sealed ball bearings and air stream cooling scrolls which permit continuous operation without overheating. The cleaner vacuums, blows, sprays, or dries. Parts that are encased or otherwise inaccessible can be cleaned with the blower attachment, while the sprayer may be used for applying paint, or for spreading

Good Lubrication starts with an orderly oil room like this



Shown is a typical Alemite Coloroute System oil room. Note how the lubricant containers, transferring equipment, lubricating equipment, grease guns, etc., are identified with Coloroute "decals." This kind of oil room setup ends disorder, confusion and human error—saves time, lubricants, machines and money.

YOU CAN CUT PRODUCTION COSTS BY MODERNIZING YOUR OIL ROOM

For the price of a 3 cent stamp, you can have the kind of oil room that takes all the guess work out of lubrication. You'll know for sure that the right lubricant will go where it's supposed to—that you'll have a ship-shape lubrication job down to the last machine.

Here's all you do. Make a check on your oil room right now. Then, think how much more efficient a new arrangement would be—how much an identification system would help to eliminate errors. Tell us how many types of greases and oil you use—or the number of "decals" you want. Give us the approximate number of containers, lubricating equipment, guns and other items you use.

Here's what Alemite will do. Fill in the coupon with the full information. We will then send you the Coloroute "decals" you need along with suggestions on how to design and operate an orderly oil room.

You buy nothing. This is simply Alemite's way of helping industry cut production costs through improved lubrication.

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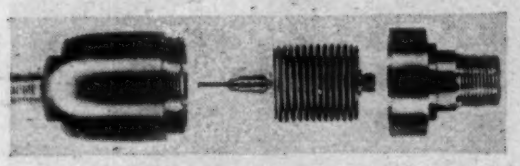
deodorants or insecticides. Heater nozzle can be used in drying motor windings, electrical equipment, and paint. Ideal Industries, Inc., 1416 Park Ave., Sycamore, Ill.

HIGH-PRESSURE VENT VALVE

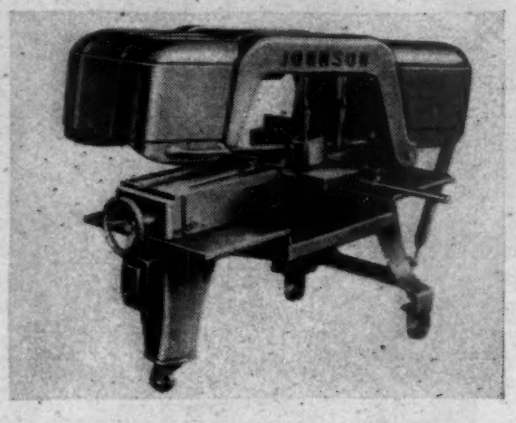
Built for heating and processing use in food, paper, wood, chemical, rubber, textile, and other industries, the J-7 Air



Eliminator is reported to cover a pressure range of 0 to 125 pounds. Valve is machined of heavy 2⅛-in. brass bar stock. Mechanism is a 1½-in. 12-convolution thermostatic bellows of monel metal. Lodge & Shipley Co., Risselt Div., Elam & Colerain Ave., Cincinnati.

HORIZONTAL BANDSAW

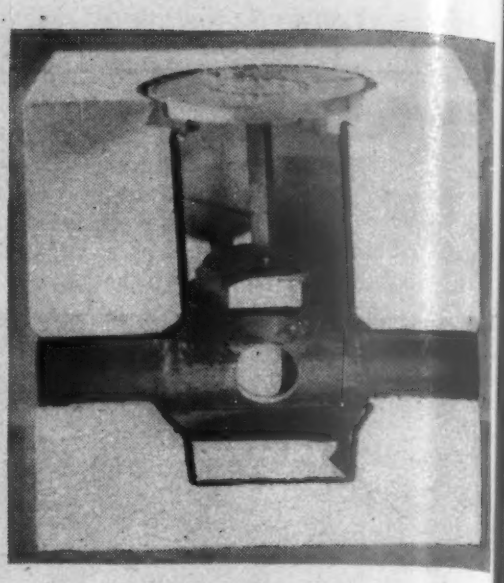
Designed to handle 10-in. rounds and 18-in. flats, Wet Model horizontal bandsaw is equipped with integral coolant unit. Operating continuously, the coolant plays directly on cut. Said to permit high cutting speed and long saw life, the saw shuts off automatically, is equipped with casters, four-speed drive, quick-acting



vise, ball-bearing motor, and guarded wheels for safety. The pump may be disconnected for dry cutting. Johnson Manufacturing Corp., 624 Chrysler Bldg., New York 17.

RADIANT HEAT VALVE

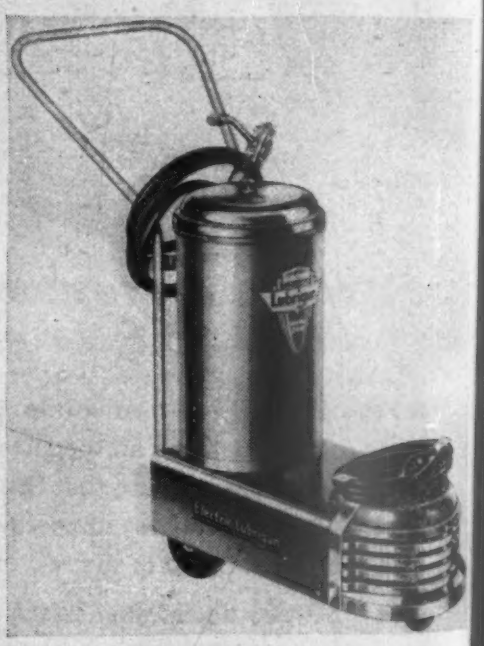
Radiantrol, a combination balancing valve and air vent, is said to eliminate need for piping, fittings, and welding. Can be used with pipe coils which are 8 inches below the concrete surface, because the hollow brass control stem can be cut to size. The stem extends from



the valve to a foot-operated brass floor plate marked to indicate open or closed position. Also available for hand operation. The valve disk is built into a wrought-iron body, made of a short piece of pipe, end-beveled for welding into a section of the heating coil. Valves are furnished in 1¼-in. size to accommodate either 1- or 1¼-in. pipe. Fiber container of the valve may be used as a concrete pouring form Valve is accessible for repair after the concrete work is down. Homestead Valve Manufacturing Co., Inc., Coraopolis, Pa

LUBRICATING GUN

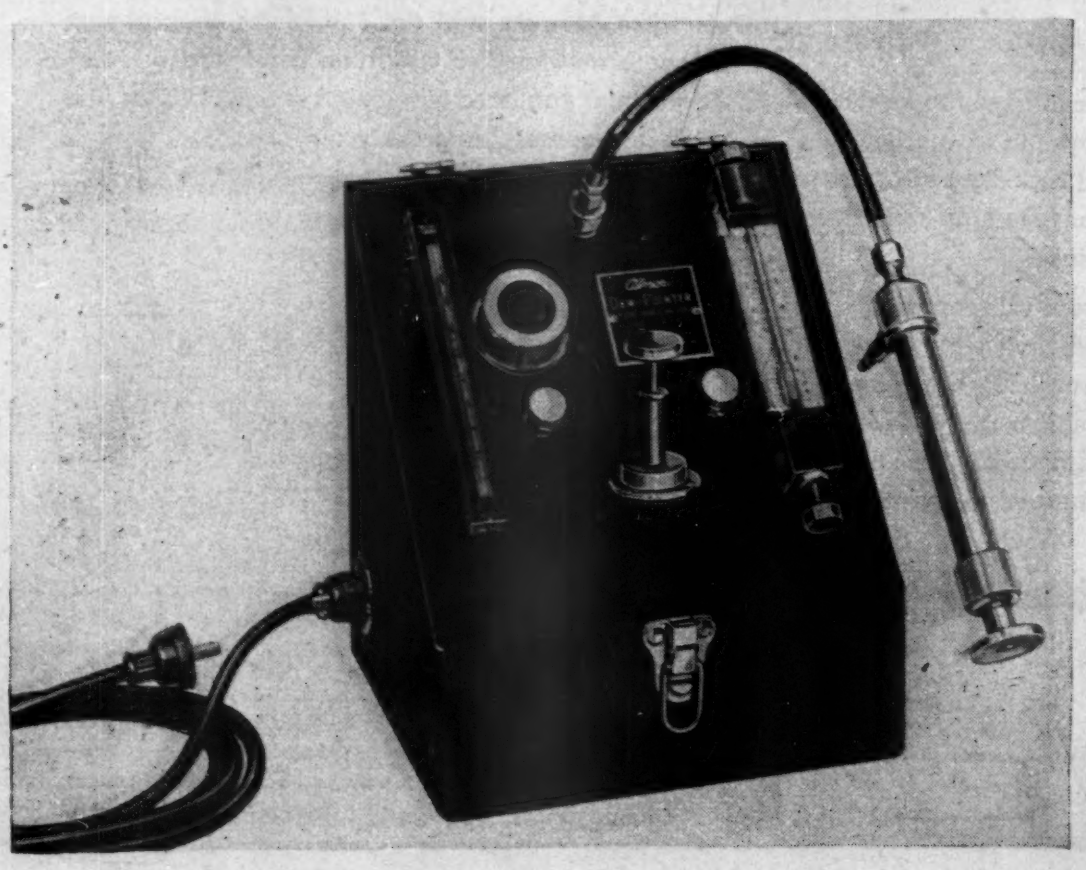
Model 244 electric-motor-operated Lubrigun is a portable, high-pressure grease gun Equipped with a positive dis-



placement pump, powered by a standard ¼-hp. universal motor for 110/115 volts, the unit is mounted on two large rubber-tired casters and one ball-bearing swivel caster. Capacity of lubricant container is 30 pounds. A 7-ft. hose assembly with control valve and a 12-ft. electric plug-in cord are standard equipment. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis 20.

DEW POINT INDICATOR

Precision-built instrument, named Alnor Dewpointer, observes dew or fog while it is suspended in the air, permitting two or more operators to get the same results. Readings are accurate, maker states, and are taken in a matter of seconds after a short period of practice. Available in two ranges—for dew point between minus 20 deg. F. and room temperature, and from minus 100 to 0 deg. F. Illinois Testing Laboratories, Inc., 420 North LaSalle St., Chicago 10.

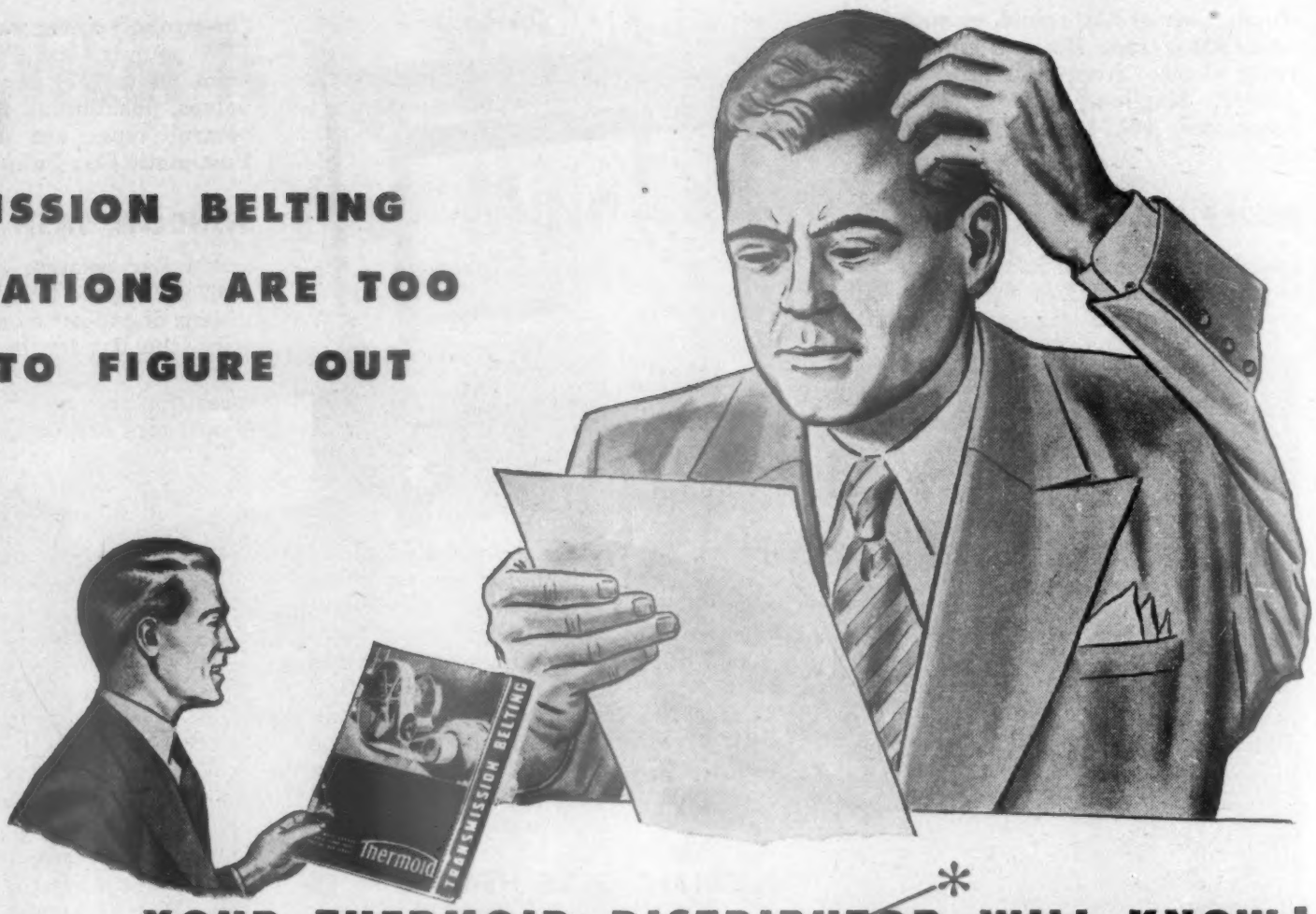


HAND TRUCK

Series "10" hand trucks are constructed of strong, lightweight, magnesium alloy. An increase in loads per day is said to result from reduction in weight of the

WHEN

TRANSMISSION BELTING SPECIFICATIONS ARE TOO TOUGH TO FIGURE OUT



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THERMOID COMPANY, TRENTON, N. J., U. S. A.

THE THERMOID LINE INCLUDES: INDUSTRIAL BRAKE LININGS AND FRICTION PRODUCTS • TRANSMISSION BELTING • F.H.P. AND MULTIPLE V-BELTS AND DRIVES • CONVEYOR BELTING • ELEVATOR BELTING • WRAPPED AND MOLDED HOSE.

truck. Carries flat, round, or sack loads up to 600 pounds. Built-in bumper prevents loads from dragging against wheels. Magline, Inc., & Marketing Associates, 904 Lapeer St., Saginaw, Mich.

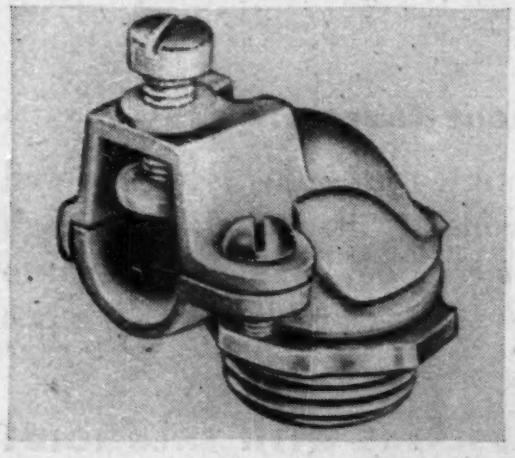
RELIEF VALVE

Damping device in relief valve is claimed to prevent squealing or chattering. Built for use in mineral oil systems, the valve

permits small range between cracking and reseating pressures and full flow with cracking pressure reaching 90 per cent of full flow. Maximum flow of Model 523-8 is 6 g.p.m.; Model 523-14, 16 g.p.m. Electrol, Inc., 85 Grand St., Kingston, N. Y.

CABLE CONNECTOR

A 90-deg. angle connector, for 1946 Code PVX cables, has "shoe-hold" cable grip, which locks the cable in the connector



without damaging the cable, maker states. Of malleable iron, the No. AC-15 connector accommodates 14-2, 14-3, 12-2, and 12-3 cables. Gedney Electric Co., 1270 Sixth Ave., New York.

PORTABLE TOTE TRAY

Four-wheel dolly is built to carry machine and engine parts to the wash rack for steam cleaning without removing them from the carrier. Known as Clean-Tote, it saves multiple handling of parts, and performs other material

moving jobs around the plant. Mounted on 4-in. full swivel, hard composition wheels, the unit is made in two models. One features an interchangeable two-deck dolly with a shallow metal tray and a wire mesh cleaning basket, which has an auxiliary fine mesh basket for small parts. The other model consists of the expanded metal basket mounted on oversized caster wheels. Homestead Valve Mfg. Co., Coraopolis, Pa.

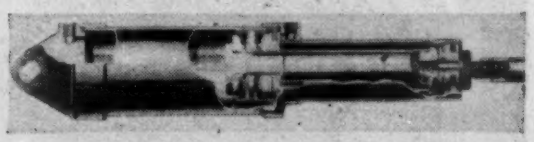
ELECTRIC GLUE HEATER

Portable electric glue heater is claimed to provide quick heat, automatically held at 150 to 160 deg. F. by a thermostat,

and is insulated to prevent heat loss. The removable glue pot is copper, nickel plated for corrosion- and wear-resistance. A heavy-duty insulated electric cord is furnished. It is built for 115-volt a.c.; heaters for 230-volt a.c. may be obtained. Hanson-Van Winkle-Munning Co., Matawan, N. J.

DIFFERENTIAL AIR ENGINES

Differential principle employed in line of air engines of various sizes and ratings permits operation with only one controlled air line. Simplified piping and controls facilitate use in multiple hook-ups, or where controls are located some

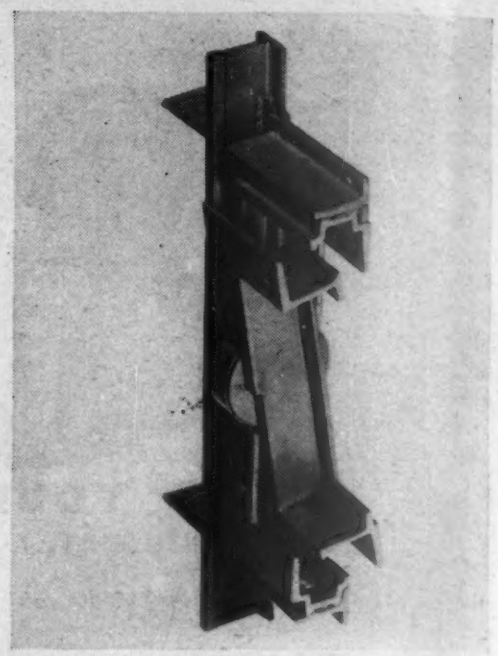


distance from the engine. Operating at 100-lb. air pressure, standard differential engines are available in sizes to deliver

"in-stroke" power ranging from 100 to 1335 pounds, and "out-stroke" power from 105 to 1070 pounds. In air control valves, pushbutton, foot, or hand lever control types are available. National Pneumatic Co., Rahway, N. J.

WINDOW SASH

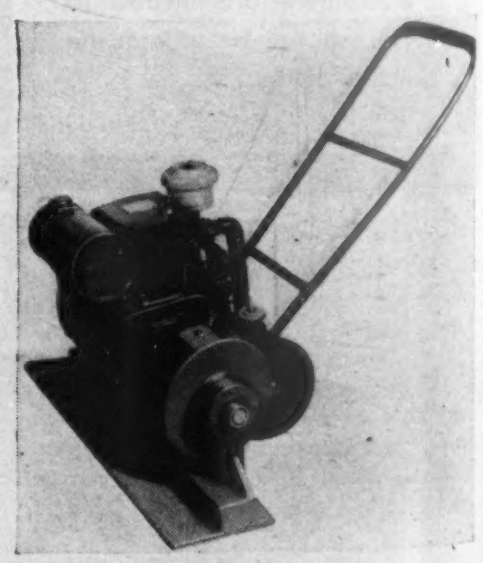
Lok'd Bar weather-tight steel window sash is designed for long life under conditions of exposure and corrosion. In the joint, the flat tee horizontal muntin is threaded through a bulb tee, with little distortion and loss of solid bar strength. Ventilators are complete casement and



frame units, solid welded at corners, reinforcing the sash. Air infiltration is less than 1 c.f.m. at 25 m.p.h. wind pressure. Sash is bonderized and finished with baked-on coat of rust inhibiting primer. Hope's Windows, Inc., Hopkins Ave., Jamestown, N. Y.

PAVING IMPACTOR

One man can handle the Wayne impactor, which tamps, to maximum density, materials such as asphalt, concrete, clay, stone, and gravel. The impactor, maker claims, travels 32



feet per minute while tamping, provides twenty-two hundred 1500-lb. strokes per minute, operates at sub-freezing temperatures, and uses 3 gallons of gasoline in eight hours. Powered by a

What is the Major Aim of Your Maintenance Program—

Avoid Excessive Wear---Keep maintenance costs down with Gulf Quality Oils and Greases

THE ability to make fast, efficient repairs is of course a vital function of any maintenance department. But for maximum plant efficiency, the emphasis should be on prevention of excessive wear and breakdowns.

The most important single factor in preventive maintenance is proper lubrication. Scientific application of high quality lubricants prevents excessive wear, helps avoid time-consuming repairs and invariably results in substantial reductions in maintenance costs.

• For effective assistance in installing the kind of lubrication practice that puts you on the "prevent" —or dollar saving—side of the picture, call in a Gulf Lubrication Engineer. He will offer concrete suggestions that will help you get higher machine efficiency, reduced down time, and lower maintenance costs. Write, wire, or phone your nearest Gulf office today.

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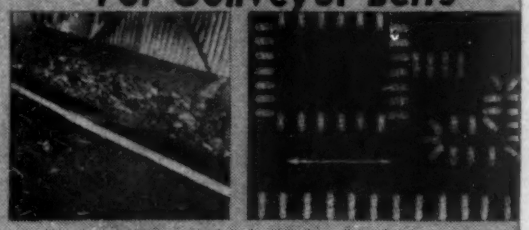
GULF INDUSTRIAL LUBRICATION

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

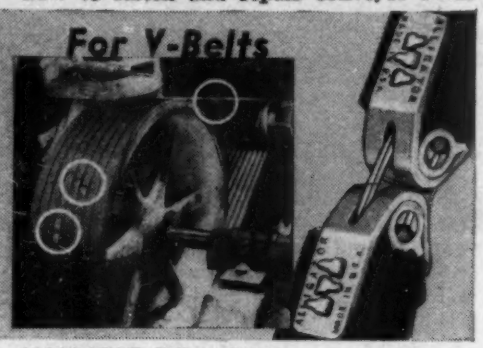
For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts



ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

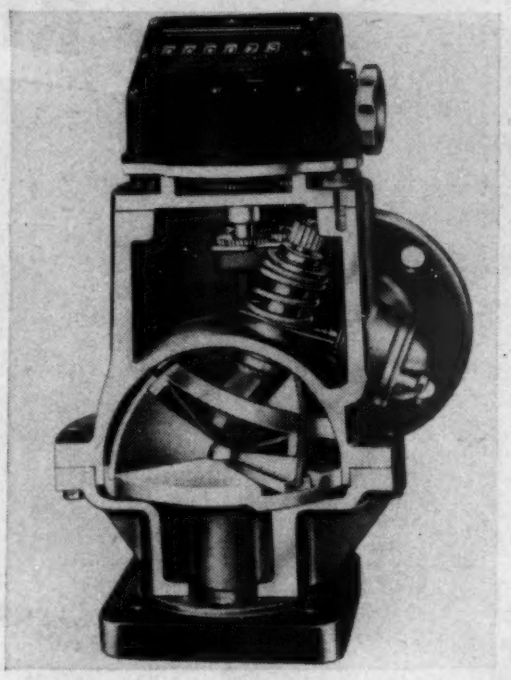
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

Wisconsin engine, the unit has rubber mountings to minimize vibration. Includes Timken bearings and rubber tires. Model 20, for medium-heavy jobs, weighs under 200 pounds; No. 36, for heavy jobs, weighs 387 pounds. Chicago Precision Machine Co., 920 South Michigan Ave., Chicago 5.

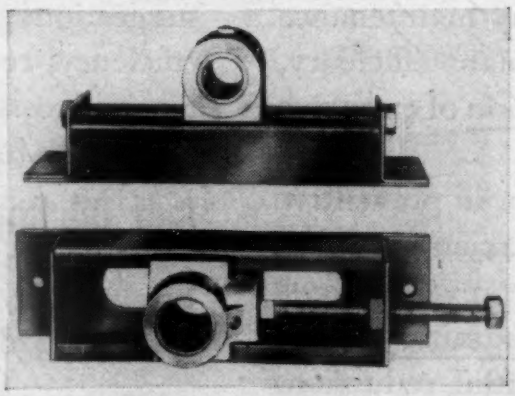
ROTARY METER

Rotary positive displacement meter is a compact unit suitable for loading racks, trucks, and bulk plant installations. The meter housing is sturdy and designed to prevent ordinary pipe strain from interfering with accuracy and performance. The meter has no oscillating, reciprocating, or nutating movements, and it is claimed to feature maximum accuracy, low head loss, and long life. The standard counter has a 6-figure totalizer, and will reset 4 figures and the red tenths wheel. The meter is adjusted through increases and decreases of volumetric displacement. Granberg Corp., 1308-67th St., Oakland 8, Calif.



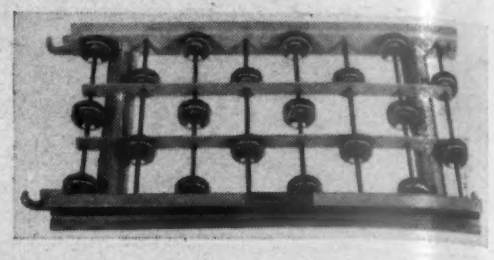
BELT CONVEYOR TAKE-UP

Built with a pressed steel frame, belt conveyor take-up has a corrosion-resistant bearing housing fabricated from a heat-treated aluminum alloy. The sealed-type, self-lubricating bearing is equipped with a porous bronze ledaloyl bushing. Sizes range from 15/16 up to 1 5/16 inch in Types A and B Take-up travel is 6 inches. Patron Transmission Co., Dept. 119, 129 Grand St., New York 13.



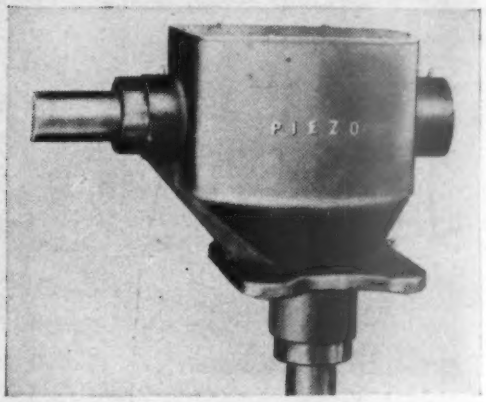
GRAVITY WHEEL CONVEYORS

Standard-sized boxes, cartons, and cases can be transported over the ball-bearing zinc-plated wheels of a lightweight, welded-steel conveyor. Made in 5- or 10-ft. sections, which are hooked together without tools, and can be handled by one man. Standard model is 14 inches, but 12- and 18-in. wheel conveyors may be obtained. The wheels contain seven precision-ground ¼-in. ball bearings. Sage Equipment Co., 30 Essex St., Buffalo 13.



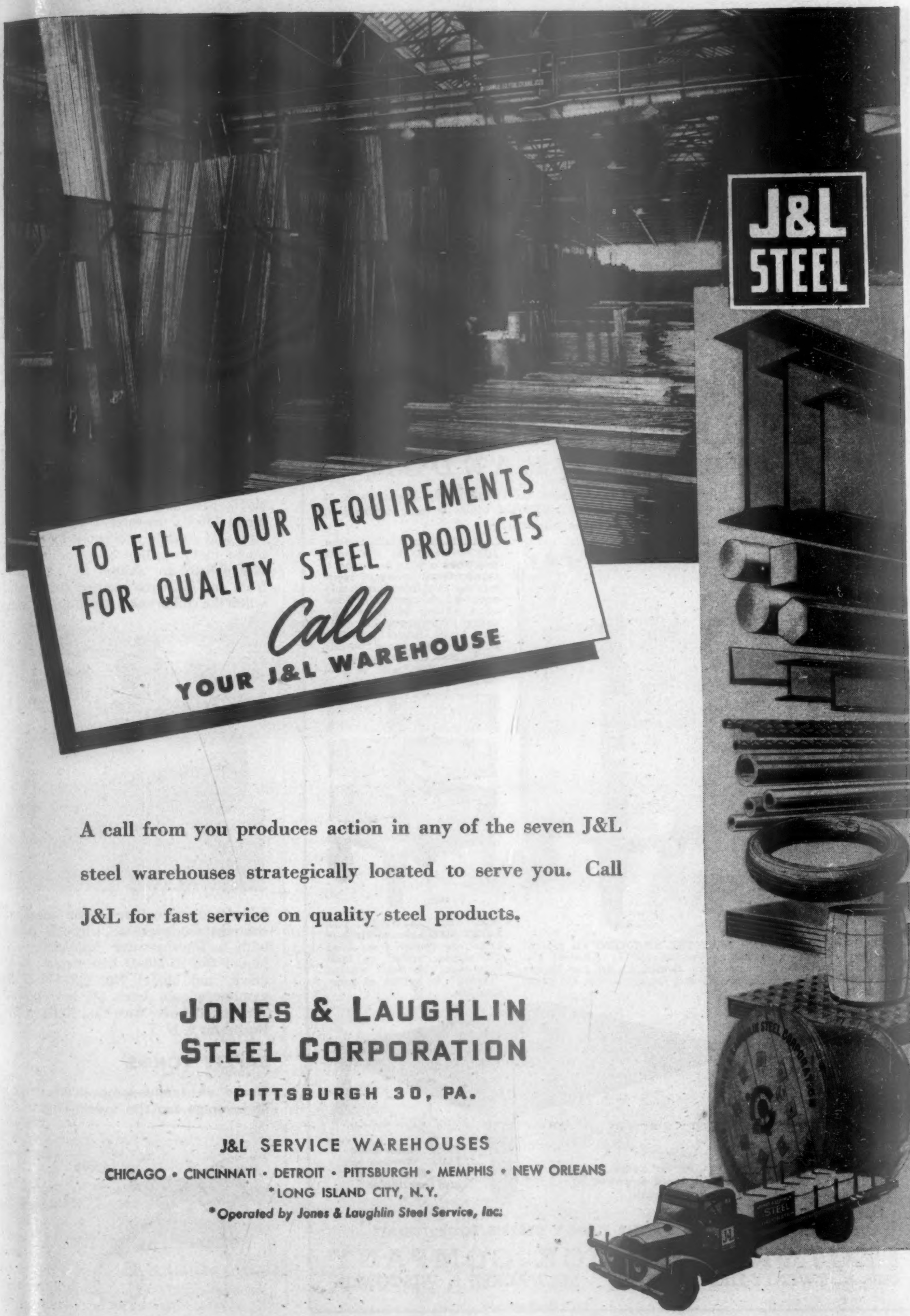
MITER GEAR BOX

Made with a solid mounting base, Type MG miter gear box may be installed in any position. Precision miter gears are claimed to assure dependable operation for medium speed power drives or hand operation with 1:1 ratio. The steel cut gears meet power and torque rating for each respective shaft diameter in conformance with the engineering standards of AGMA, maker says. Furnished with bronze or roller bearings, as required. The hydraulic type grease fittings lubricate the bearings, and oil seals prevent leakage. Steel shafts are keyed to the gears. Six sizes are available with ½- to 1¾-in. shaft diameters. Suitable for use in the operation of shafting around corners at 90 degrees, and in the operating controls of valves, doors, steering gears, and power drives. Piezo Manufacturing Corp., Dept. MFM, 110 East 42nd St., New York 17.



ELECTRONIC AREA METER

Viscous liquids such as black liquor, tar, chemicals, distillates, and refrigerants, as well as water, oil, and gasoline are measured by area meter. The instrument consists of a telemetering transmitter connected to a standard electronic receiver. The transmitter is installed in the pipeline like a valve. The recorder is constructed of packaged electronic components which do not need to be carefully leveled, and are not affected by vibration. Unit may be calibrated to read in terms, of volumetric units, thereby re-



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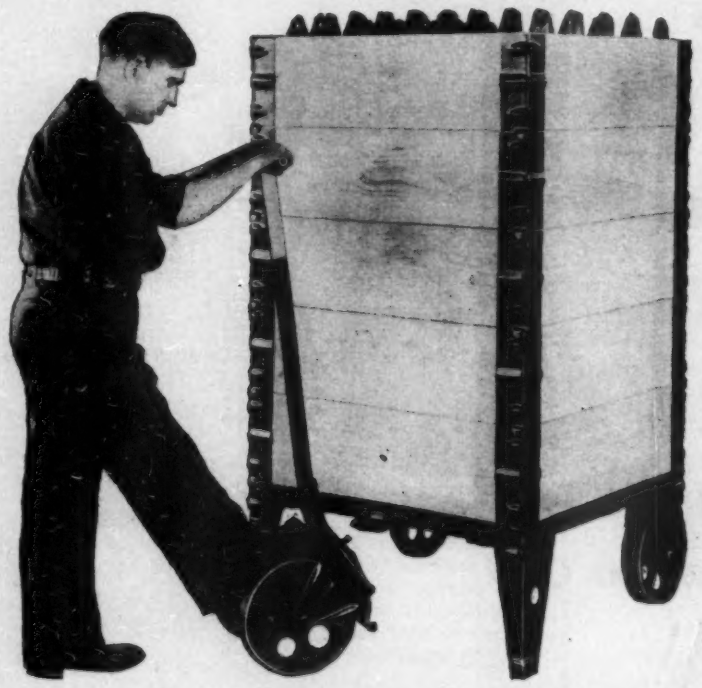
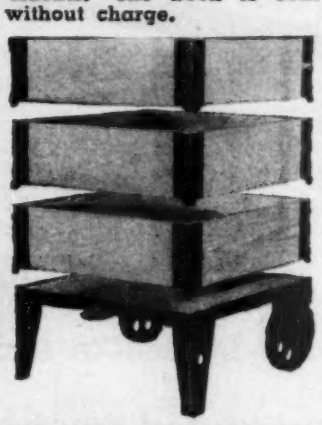
THE TURNER SYSTEM OF MATERIALS HANDLING

Just off the press and full of important new ideas on reducing the high costs of material handling, this new book on the TURNER SYSTEM offers a real contribution toward making greater profit in almost any size business.



In addition to outlining the TURNER SYSTEM the book describes a plan for using a standardized series of interlocking and interchangeable units which can be applied at a saving to practically every plant operation. This plan cuts labor, handling and storage expense, speeds production and reduces accidents. The book is sent without charge.



"DELIVER THE BIN AND SAVE THE HANDLING" is typical of Turner System savings. Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand jimmy, power lift truck, crane or tractor.

BINS ARE ALWAYS THE RIGHT SIZE because Bin Sections are removed as load diminishes, added as load increases. No time wasted "diving" to bottom of oversize bin.

PALLETS THAT LAST 10 YEARS INSTEAD OF ONE

If you have been throwing money away on expendable pallets, these new, rugged, 8-way accessibility pallets can bring you remarkable savings. They stand up for years under hard use, function efficiently with hand or power lift trucks, stack on themselves and other units.

Floor Plate Deck Pallet. Wooden or Flat Steel Decks also available.

SEND FOR YOUR COPY OF THE TURNER SYSTEM BOOK TODAY!

FACTORY SERVICE COMPANY

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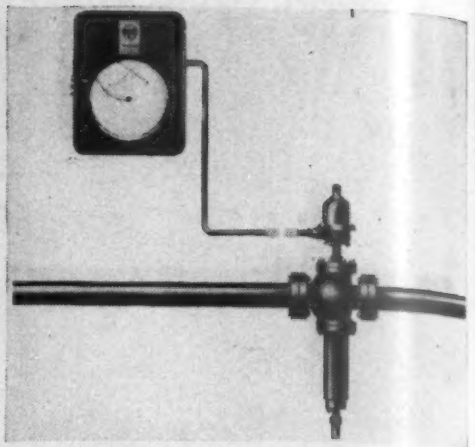


ducing errors caused by density changes. Two transmitters may be connected to the same recorder to measure the ratio, sum, or difference of two flows. Built for 115-volt, 50/60-cycle a.c. operation, the meter requires 60 volt-amperes for transmitter and receiver. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.

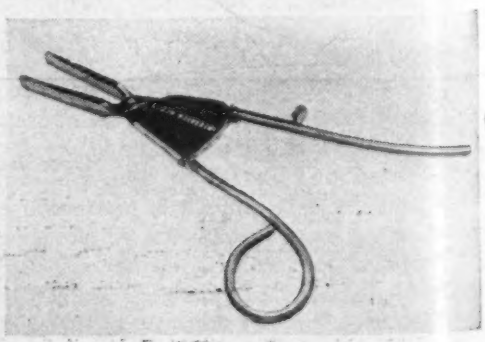
AIR COMPRESSOR

Single-unit air compressor provides the performance characteristics of two separate compressors—2.4 c.f.m. of free air at 50-lb. pressure, and 1-2 c.f.m. of free air at 150-lb. pressure. Change in pressure and volume is effected by an automatic motor pulley and sliding motor base which are shifted by hand lever from one pressure position to the other while the compressor is running. Change

in setting varies the motor speed and controls the pressure through contact with a low-pressure unloader valve. Model No. A-140-D has electric motor drive, and Model No. GE-140-D has gasoline engine drive (¾ horsepower). American Brake Shoe Co., Kellogg Div., Rochester 9, N. Y.

SAFETY TONGS

Guard on safety tongs protects point of leverage for the index finger. The



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Haskelite* Plymetl unites plywood's great rigid strength and light weight with the tensile strength of sheet metal. The many users of Haskelite Plymetl find it a material with a flat, smooth, ripple free surface that adds new eye appeal to the products they use it on.

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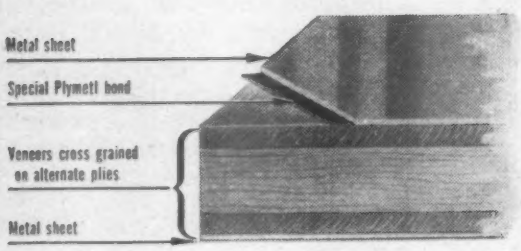
*T.M. Reg.

CUTS WEIGHT AND BULK — SIMPLIFIES FABRICATION

PLYMETL



Plymetl consists of light gauge metal sheets permanently bonded to one or both sides of a plywood panel. Sheets of zinc coated steel, aluminum or other metals may be used. One type of material may be bonded to one side of the panel, and another type to the other if desired. Panels of Haskelite Plymetl are easily fabricated with simple metal or wood working tools. It may be obtained in a range of thicknesses and sizes to fit specific requirements.

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Diesel locomotive side panels, escalator panels, table tops, truck trailer side panels, delivery truck bodies, railway passenger car interiors, bakery proof boxes, bread coolers, air conditioning equipment, low temperature drying ovens, etc.

HASKELITE T.M. Reg. *structural materials for men who build better*

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Canada: Railway & Power Engineering Corp., Ltd.

Any way you look at it "KEX" INDUSTRIAL WIPING TOWELS are SAFE!

Safety—KEX Wiping Towels have no uneven, ragged edging that can catch onto and damage machinery, or cause accidents. They are unlike cast-offs that have served other purposes or their usefulness. A KEX towel is compact and adapts itself to the hand. Their smooth textured surfaces and finishes are important safety factors.

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Softness—You can use KEX Wiping Towels on the most delicate polished surface. There isn't a hard seam, button or bit of hidden abrasive to scratch or mar.

Usable Space—Big, tough and uniform in size, KEX Wiping Towels can be used right to their very edges.

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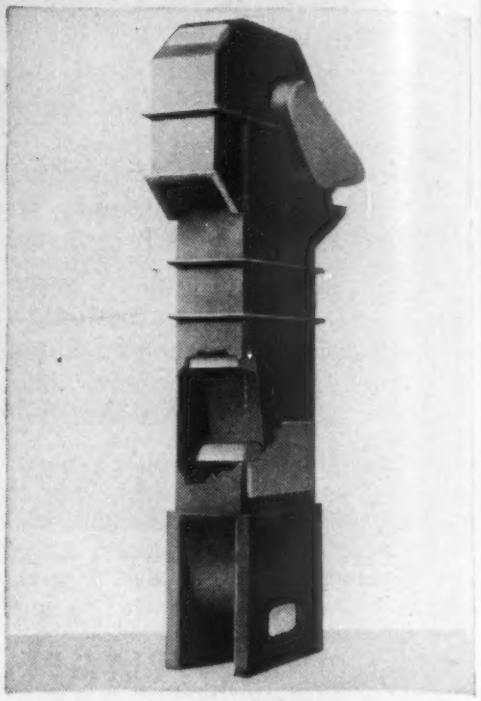
lightweight tongs are of drop-forged steel and have long, thin, soft iron nose designed to prevent die breakage. Wolverine Tool Co., 1480 East Woodbridge, Detroit 7.

BUCKET-TYPE CONVEYOR

Conveyor designed for moving ashes, coal, sand, and other bulk materials up to 2x4 inches in size can be furnished



with floating wall sections and special belt lengths which will raise discharge elevation to any height up to 50 feet. Housing is 2 feet by 15 inches at base. Capacity of the self-powered bucket-type conveyor is 40 tons per hour. Conveyors For Industry, P. O. Box 5026, Cleveland.

STACK COATING

Designed for diesel exhaust pipes, boiler breechings, stacks, and other use in temperatures up to 600 deg. F., No. 1132 stack coating has silicone resin base. Said to resist corrosive chemicals and weathering. Amercoat Div., American Pipe & Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54.

POLISHER AND SANDER

Lightweight, portable Type F-5 polisher and sander weighs 4 pounds and is said to be powerful enough to perform all types of sanding, polishing, buffing, and other rotary operations on a 5-in. disk. Designed for small jobs or intermittent

ENGINEERED AND MOLDED AT NO. 1 PLASTICS AVENUE

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First of its kind! It's a one-piece all-plastics dinghy—produced by General Electric for the Beetle Boat Company, New Bedford, Massachusetts. A single giant mold forms the entire nine-foot boat in one unit. General Electric engineers specified the particular plastic materials that make this unique boat leakproof, light, and buoyant . . . yet so strong and tough that it withstands amazing abuse. And it requires no maintenance!

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ALL TYPES OF PLASTICS. Facilities for compression, injection, transfer and cold molding . . . for high and low pressure laminating . . . for fabricating. G-E Quality Control—a by-word in industry, means as many as 160 inspections and analyses for a single plastic part.

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CD47-A26

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Take the "Paper-Work" out of Production Control and Costs!

How many different people copy and recopy essential data from your Shop Orders, Time or Transfer Tickets and other shop forms for control of Production, Costs, etc.? It usually adds up to a lot of expensive "paper-work" that's subject to the delays and mistakes of many hands and heads.

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You simply visualize multiple copies of such records as Shop Orders, Time Tickets, etc. to eliminate rehandling and recopying operations. Whether two or a half dozen, they are written but once, all are available at once, and all are the same. No hidden records, no delays, no differences. "Paper" works for you instead of creating work.

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Write today for a copy of "The ABC's of Production Control" and other material suggesting how you can use McCaskey Methods profitably. Or better still, let us have a representative outline a plan for your particular needs.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

use, it is operated and controlled by trigger switch and pistol handle. Spindle turning at 5000 r.p.m. idle speed gives a normal load speed of 3000 r.p.m. The motor is 115-volt, a.c.-d.c. A 3-in. disk is also available with 3-in. sandpaper and a 5-in. lamb's wool polishing pad. Clarke Sanding Machine Co., 11 Clay Ave., Muskegon, Mich.

RUBBER GLOVE

Corrugated patches on palm, thumb, and fingers of neoprene glove are said to provide positive grip and double thick-

ness at wearing points. The patches are made of the same material as the glove. Available in sizes 10 to 11. Surety Rubber Co., Carrollton, Ohio.

SKID AND SKID BOX

Phil-Tier skid and Phil-Tier box are constructed for hauling or storing parts, products, and scrap. Can be used with either platform or fork lift trucks. When stacked, the open skids provide access to materials. Box is used for materials not adapted to neat piling. Both units can be stacked separately or interchangeably on sturdy cupped feet designed for maximum floor protection. Racks are made of double corrugated steel plates laid crosswise. Units furnished to re-

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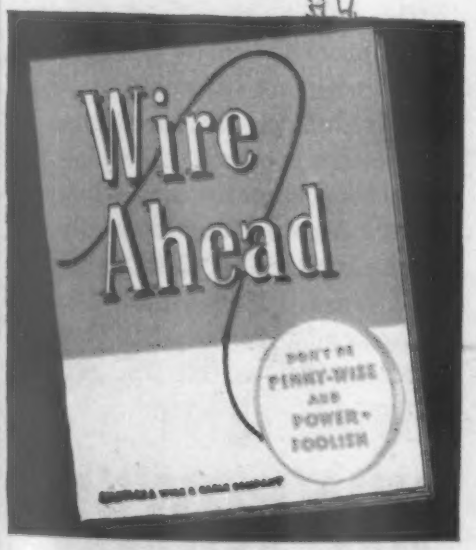
Inadequate Wiring, the industrial jinx, is at it every day. For overtaxed, overextended, obsolete wiring is cutting the efficiency of men and machines by 25 to 50 percent in hundreds of plants. Your plant power engineer, your consulting engineer, electrical contractor or utility power salesman can find this jinx . . . *and throw him out!*

47447

Because adequate wiring is basic ... and affects everyone in our industry ... Anaconda continues to promote this idea in a wide list of national magazines.



*WIRE AHEAD, a new booklet discussing preventive maintenance . . . the symptoms of inadequate wiring . . . and presenting plans for anticipating electrical demand, is now available on request. Address Advertising Department, 25 Broadway, New York 4, N.Y.

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from mine to consumer

ANACONDA WIRE AND CABLE COMPANY

for Longer Battery Life

CHARGE YOUR ELECTRICAL INDUSTRIAL TRUCK BATTERIES WITH THE

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TYPE "K"
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BATTERY CHARGER

Type "K" Single Circuit Control Panel

● Whether you need only a single-circuit battery charger or one that will charge from two to a dozen or more batteries at one time, there's a Hertner Type "K" motor-generator charger to suit your requirements — a fully automatic charging unit with:

1 **Automatic** control of charging rate.
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4 **Automatic** protection against reversal of current.
5 **Overload protection** to both motor and generator.

Mail the coupon for Bulletin 104 describing Hertner Type "K" single-circuit chargers, or Bulletin 108 describing Type "K" multiple-circuit chargers.

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The* HERTNER *Electric Co.
A General Precision Equipment Corporation Subsidiary
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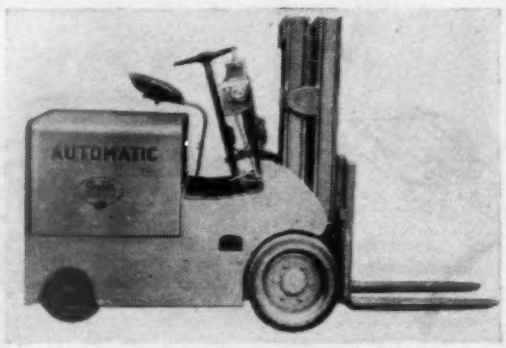
quired dimensions, with provision for underclearance necessary for the lift trucks. Phillips Mine & Supply Co., 2227 Jane St., Pittsburgh 3.

DIAPHRAGM VALVES

Diaphragm-type valves are made in the alloys known as Duriron and Durichlor, for handling corrosive solutions. The Duriron valve is said to be resistant to sulfuric, nitric, and acetic acids at any temperature; the Durichlor valve is for use with all concentrations of hydrochloric acid at temperatures below the boiling point. The valves have same basic three-unit construction—bonnet assembly, diaphragm, and body—as Hills-McCanna Saunders Patent valves. Severe slurry service has little effect on any part of the body, according to the maker, because the two alloys are little effect on any part of the body, maker states, because the two alloys are hard and abrasion resisting. The Duriron Co., Inc., Dayton 1, Ohio.

FORK TRUCK

Capable of tiering to truck and trailer ceilings as low as 68 inches, electric fork truck, available in 2000- to 4000-lb. capacities, has a telescopic lift of 100 inches. Has dead man control, and can be mounted from either side. It is equipped with automatic gearshift, silicone varnish insulation on motors, disk-type traction brake, high-pressure hydraulic system. Automatic Transportation Co., 149 West 87th St., Chicago.



PORTABLE DRILL

Metalmaster ¼-in. palm drill features a pistol grip with a trigger switch which can be locked or released with one

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WORK GLOVES ...FOR PLUS PROTECTION

PROTECTION— Protects against abrasion, acids, alkalies, chemicals, corrosives, stains, salt-water, slime and irritants.

DEXTERITY— Special curvature designed to fit natural hand contours.

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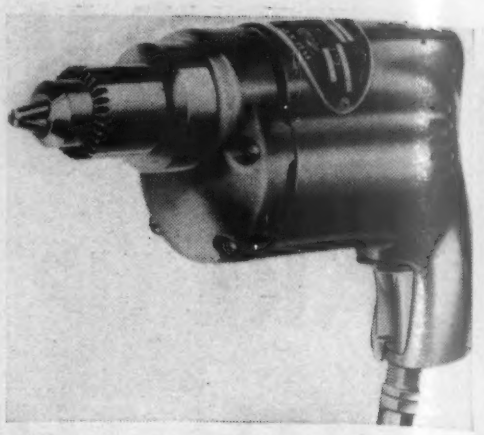
DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION



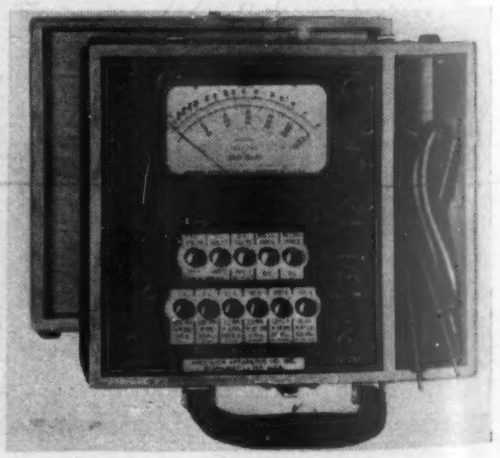
finger of the gripping hand. Ball bearings and heat-treated chrom-molybodenum steel helical gears are used. A 3-jaw Jacobs chuck with key and patented key holder, and 15 feet of 3-conductor rubber-covered cable and plug are supplied. Drill capacity is ¼ inch in steel and ½ inch in hardwood. A 110-volt a.c.-d.c. motor drives the drill at 1100 r.p.m. with full load, and 1900 r.p.m. without load. Motors in other voltages can be furnished. Bradford Machine Tool Co., Evans and Viaduct Sts., Cincinnati 4.

MASONRY COATING

Para-StoneTex concrete and masonry paint of chlorinated rubber is compounded to eliminate saponification and to withstand weather, acids, alkali, and salts. It is said to be easy to brush on, to lay on a vertical surface without runs or sags, to show no sign of lapping where work is resumed, and, when applied over surfaces of uneven porosity, to show no bright or dead spots. The Truscon Laboratories, Detroit 11.

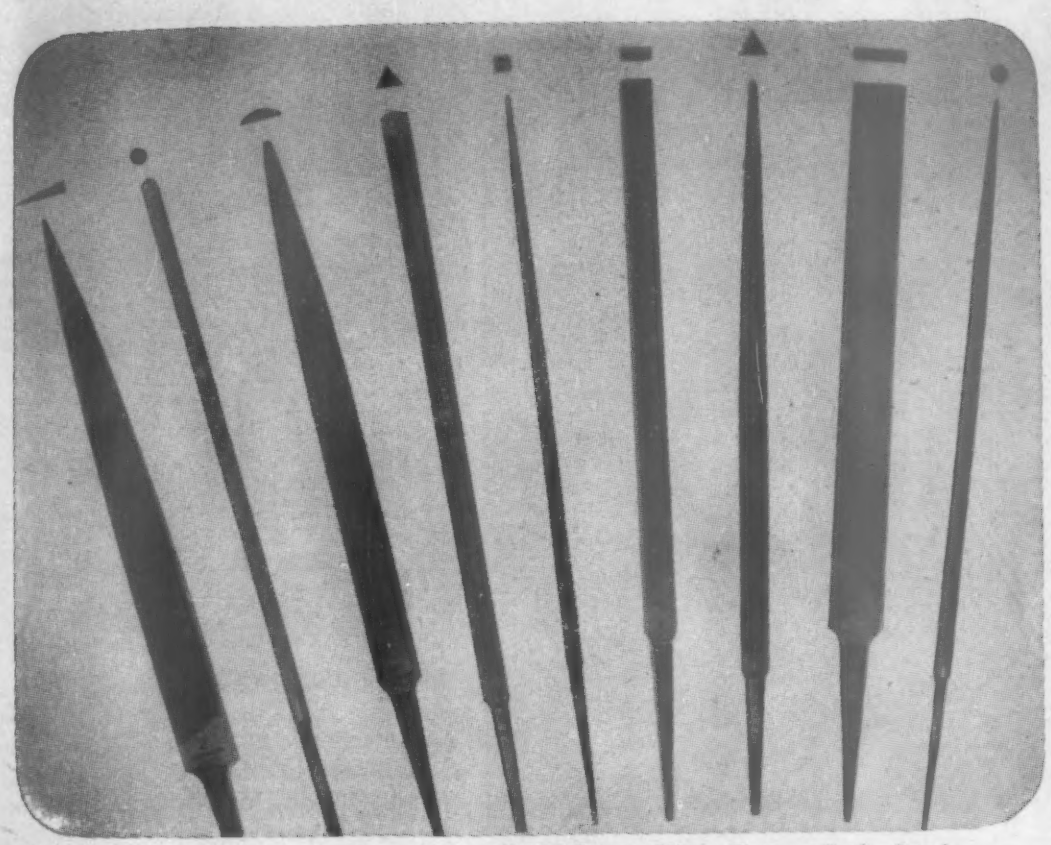
ELECTRONIC CIRCUIT METER

Series 858 Multi-Master electronic circuit meter features an automatic push-button range and function selection. Maker states it is a super-sensitive, 20,000 ohm-per-volt test set engineered for reliable high-speed measurments. One row of buttons selects functions such as volts, ohms, mils, decibels, amperes, and microamperes. Another row selects any of 54 ranges. A 600-megohm insulation resistance test range is provided in addition to five self-contained ohmmeter ranges to 60 megohms; 6000-volt range jacks are recessed for safety. Set incorporates a 50-microampere, 4⅝-inch, rectangular meter. All standard functions are available at two polarized tip jacks. Supplied with internal ohmmeter



TRADE X·F· MARK

POP'S SCHOOL OF FILING



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—says Pop the Foreman

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Precision filing calls for precision files—X.F. Swiss Pattern Files made by Nicholson. More exacting measurements . . . smaller points . . . longer tapers — these are features that distinguish Swiss Pattern Files from American Pattern. More careful design, accurate cut, and uniform hardness are characteristics which have made "X.F." the largest selling file brand of its type.

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In Canada: Northern Electric Co., Ltd . . . . . Crane, Ltd.

batteries and high voltage test leads. Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, N. Y.

FORK TRUCK

Carloader fork truck has been redesigned for a maximum standard lift of 120 inches, forks lowered. Driver's seat is adjustable, has backrest. Pivoted steering axle, mechanical governor, water

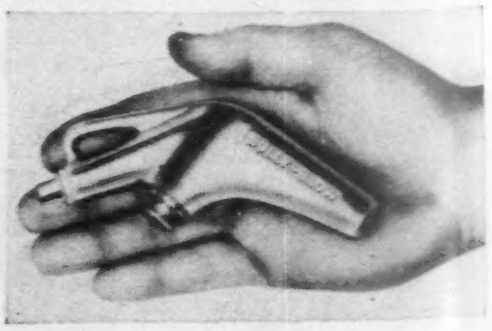
pump, steel hub wheels, and engine exhaust through rear counterweight horizontally at 15-in. height are among the features claimed. Made in 72-in. low-lift, 120-in. high-lift, and 144-in. extra high-lift sizes. High-Lo-Stack lift, which has 63-in. "free" lift and 130-in. maximum lift, is extra equipment. Clark Tructractor Div., Clark Equipment Co., 258 West Champion St., Battle Creek.

FUEL OIL SLUDGE REMOVER

Liquid fuel oil treatment is said to clean entire fuel system, from storage tank to burner tip, reducing cleaning operations to brushing or blowing. Added in the ratio of 1 quart to 1000 gallons of fuel oil, the treatment gradually dissolves sludge and emulsifies water and oil, says manufacturer, so that sludge and water are consumed as the fuel oil is burned. Remaining fine carbon particles can be removed mechanically. Treatment is claimed to be non-corroding. Elraco Engineering Co., 732 West 58th St., Los Angeles 37.

BLOWGUN

Featuring the Bully regulating trigger, blowgun is designed for delicate cleaning jobs. Pressure on the trigger governs the amount of air ranging from a gentle flow to a full, powerful blast. Made of high-strength aluminum, the blowgun weighs 10 ounces, has no stuffing box,



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ELECTRIC HOIST

• Here's the first heavy-duty electric hoist in the light-duty field. Rugged. Powerful. Fast. Safe. Efficient. A streamlined package of power in capacities of 250 lbs. to 2000 lbs.—redesigned throughout to take over material handling problems where minutes mean money. Ask your Wright distributor. Or write us at York, Pa., for descriptive folder DH-1250.

ACCO

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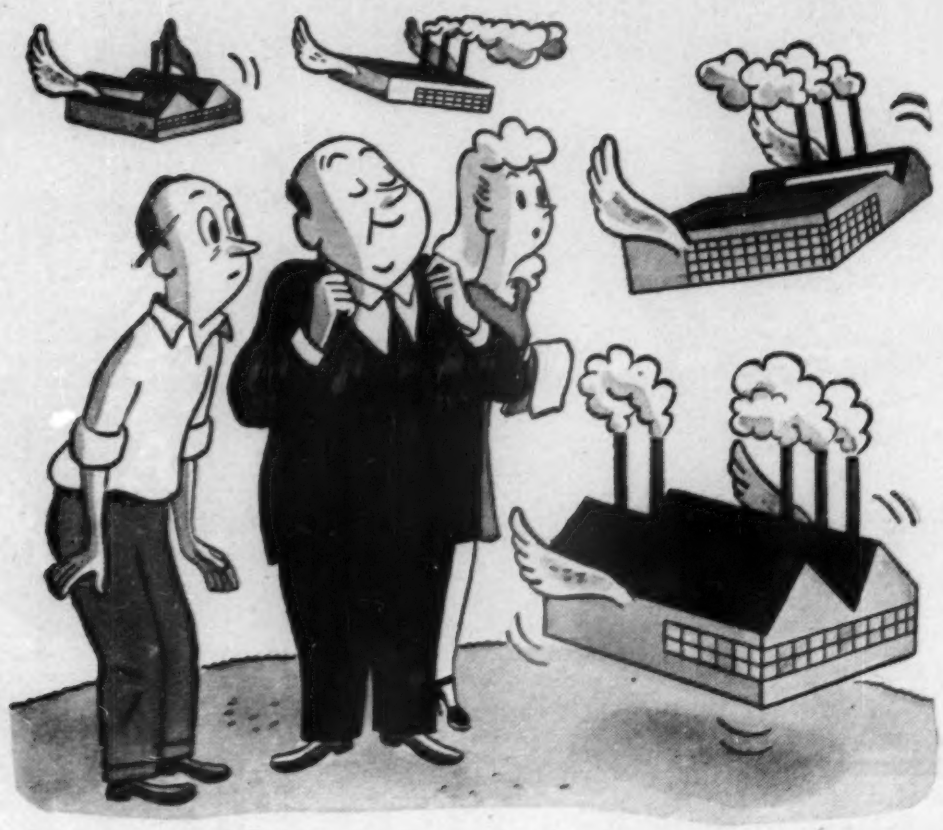
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

How to bring those distant suppliers closer to home



It's like having all your suppliers close at hand, when you specify Air Express delivery. Air Express gets you what's wanted in mere hours . . . no matter *where* your suppliers are located.

Planes carrying your Air Express shipments are bigger and faster today. Even overnight coast-to-coast deliveries are routine. Same day delivery between many airport towns and cities. And Air Express rates are *low*. Use this speedy, profitable service regularly to keep customers satisfied, and business running without a hitch.

Specify Air Express—it's Good Business

- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost. • Moves on all flights of all Scheduled Airlines.
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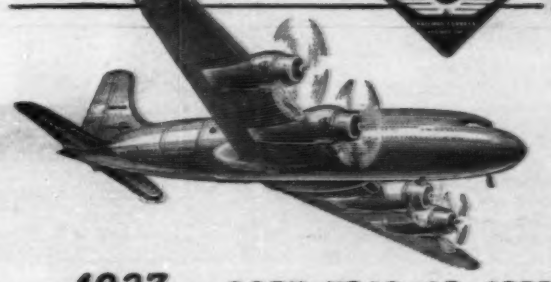
Just phone your local Air Express Division, Railway Express Agency, for fast shipping action . . . Write today for Schedule of Domestic and International Rates. Address Air Express, 230 Park Ave., New York 17. Or ask for it at any Airline or Railway Express Office. Air Express Division, Railway Express Agency, representing the Airlines of the U.S.

AIR EXPRESS

AIR EXPRESS

GETS THERE FIRST



Fastest delivery—at low rates

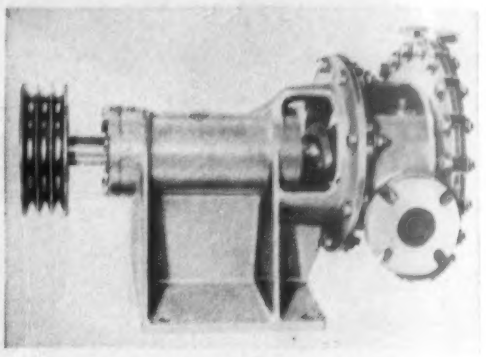
Trailer parts (31 lbs.) needed in Los Angeles *fast*. Picked up at Portland, Ore., factory 5 PM on 13th, delivered first thing next AM 821 miles away—*in time!* Air Express charge $12.52! Other weights, any distance equally inexpensive and *fast!*

1927—20TH YEAR OF GETTING THERE FIRST!—1947

disks, or springs, and is leak-proof. It fits in the hand, and is balanced. Can be hung out of the way when not in use by means of bar at top of gun. The air connection is standard ¼-in. pipe thread. Superior Manufacturing Co., 940 Public Square Bldg., Cleveland 13.

CENTRIFUGAL PUMPS

Line of centrifugal process pumps is designed for handling corrosive and abrasive liquids where severe wear is encountered. Pumps are equipped with



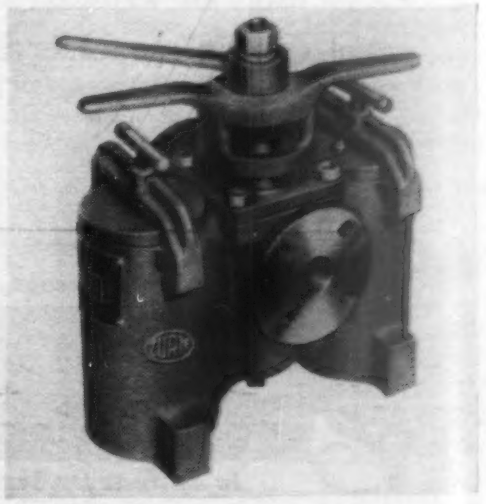
large shaft, heavy bearings, and are of thick metal. The bearing pedestal for supporting pump parts and rotating assembly is cast in one piece for maximum rigidity. Pump parts subject to severe wear are all separate pieces, and can be replaced. The pumps are made in five sizes with capacities up to 1300 g.p.m. at heads to 275 feet. Allis-Chalmers Mfg. Co., Milwaukee 1.

BELT CONVEYOR

Levelbelt horizontal belt conveyor is available in lengths from 21 to 161 feet; in heights of 28, 32, and 36 inches. Uses power up to one horsepower. Speed is 60 f.p.m. in either direction. The take-up is incorporated with the drive mechanism. Roller bed has ball bearing rollers, 1.9 inch in diameter, on 8-in. centers. Standard Conveyor Co., North St. Paul 9, Minn.

SEDIMENT STRAINER

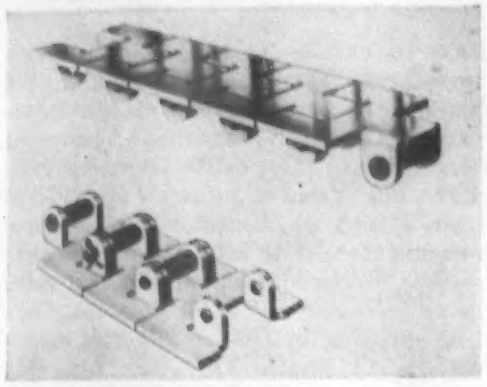
Duplex sediment strainer has been developed for use in liquid pipelines where continuous flow is required. Unit operates by means of a single plug-type valve with orifices which direct the flow from the inlet to either of two baskets or to both simultaneously. Flow can be di-



verted from one basket to another without interrupting passage through the strainer. Plug action is said to be non-freezing. Dual air-relief valves are furnished. Available with screwed or flanged connections for working pressures from 125 to 300 pounds. Cover of basket chamber is held down by yoke or C-clamp, as desired. Made in bronze, steel, semi-steel, or special alloys, in sizes 1 to 6 inches; larger sizes may be obtained. J. A. Zurn Manufacturing Co., Erie, Pa.

CONVEYOR CHAIN

Flat top conveyor chain can be used for packaging and handling bottles, cans, and jars. Each link is the same, eliminating need for special coupling links. The top plate carrying surface also acts as the side bar of the link, and is ground



after assembly to insure a smooth surface. The chain is available in 1½-in. pitch and top plate of any width from 3 to 7½ inches. It may be obtained in carbon steel with pins and bushings carburized and hardened, or in Type 304-18-8 stainless steel with hardened alloy pins and bushings. The chain will operate over No. 60 extended pitch sprockets, or over extra width sprockets designed for use with the chain. The Wade Morrison Co., 18401 Shaker Blvd., Cleveland.

GAS CYLINDER VALVE

Se-Co packless stem valve, for oxygen and acetylene cylinders, is designed for non-freezing operation. Brass retaining washer, secured by Waldes snap ring, prevents accidental dissembling of valve, of wedging of spindle at wide open position. Downward motion of spindle is halted by neoprene valve seat, and a metal-to-metal contact. With heavy-duty forged brass body, full-grip hand wheel, and neoprene "O" rings, it weighs 1.35 pounds. Height open is 4½ inches; closed, 4¼ inches. Operates in pressures from 1 ounce to 3500 p.s.i; in temperatures of 70 to 250 deg. F. Security Valve Co., 410 San Fernando Rd., Los Angeles 31.

CHEMICALLY INERT GASKETS

Chemiseal gaskets are fabricated from resilient Teflon (Polytetra-fluoro-ethylene), which is claimed to be fully resistant to the chemical action of organic and inorganic acids, bases, and similar materials. No known material, except melted sodium, and fluorine

Job time cut from 6 hours to ONE

Read What Mr. Burt Sheehan, Plant Engineer of the Preservative Paint Co., Seattle, Washington, says about their Roper Installation.

● "Our product, Plastic Leak-Tite, is a heavy roof putty for stopping leaks on asphalt roofs and around flashings. ● Containers were previously filled by hand with a putty knife and scoop. ● With the Roper Pump installation we now fill in one hour the same number of containers that were formerly filled in six hours. ● In addition to the saving of time, the operation is very much cleaner and neater."

SOLVING ONE OF THOSE "IMPOSSIBLE" JOBS!

Another example of Roper engineering solving one of those so-called "impossible" jobs . . . transferring a heavy viscous roofing compound at a maximum speed of 16 g.p.m.
The Roper Pump is mounted with a 3 h.p. motor, backgearing and 4-speed transmission on an Air Corps bomb truck so as to facilitate moving the equipment from one batch mixer to another.
Let Roper engineering help solve your pumping problems!

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ROPER Rotary Pumps

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Adds a Story

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THE *extra* space you looked for down the length and across the width of your warehouse, the Crescent PALLETIER finds high above the floor. With the reach of a giant, the PALLETIER stacks pallet loads to the rafters. It may double your storage capacity...save the cost of a new building.

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ONLY *Crescent* HAS ALL 5

- **Full Magnetic Contactor Control** protects against forced acceleration—extends life of motor and tires.
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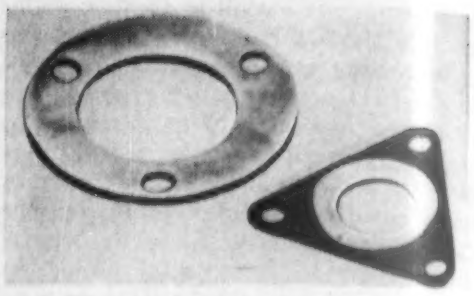


under pressure, causes any physical change, maker says, and temperatures ranging from minus 200 to plus 500 deg. F. can be accommodated without brittleness or decomposition. The anti-adhesive properties of the gaskets prevent them from sticking to flanges or becoming coated with process materials. United States Gasket Co., 691 North 10th St., Camden, N. J.

ELECTRIC VALVE CONTROL

Said to extend valve life, to provide smooth, trouble-free operation in the handling of air, water, gas, oil, and steam under low or high pressure and temperature, electric valve control operates gate, globe, angle, and other screw type valves from 1 inch up. Suitable for pressures ranging from 25 to 6000 pounds. No current is required to maintain the valve in either open or closed position. Control operates on 110- or 220-volt a.c. or d.c. circuit. Shafer Valve Co., Inc., P.O. Box 83, Mansfield, Ohio.

TOTEBOX

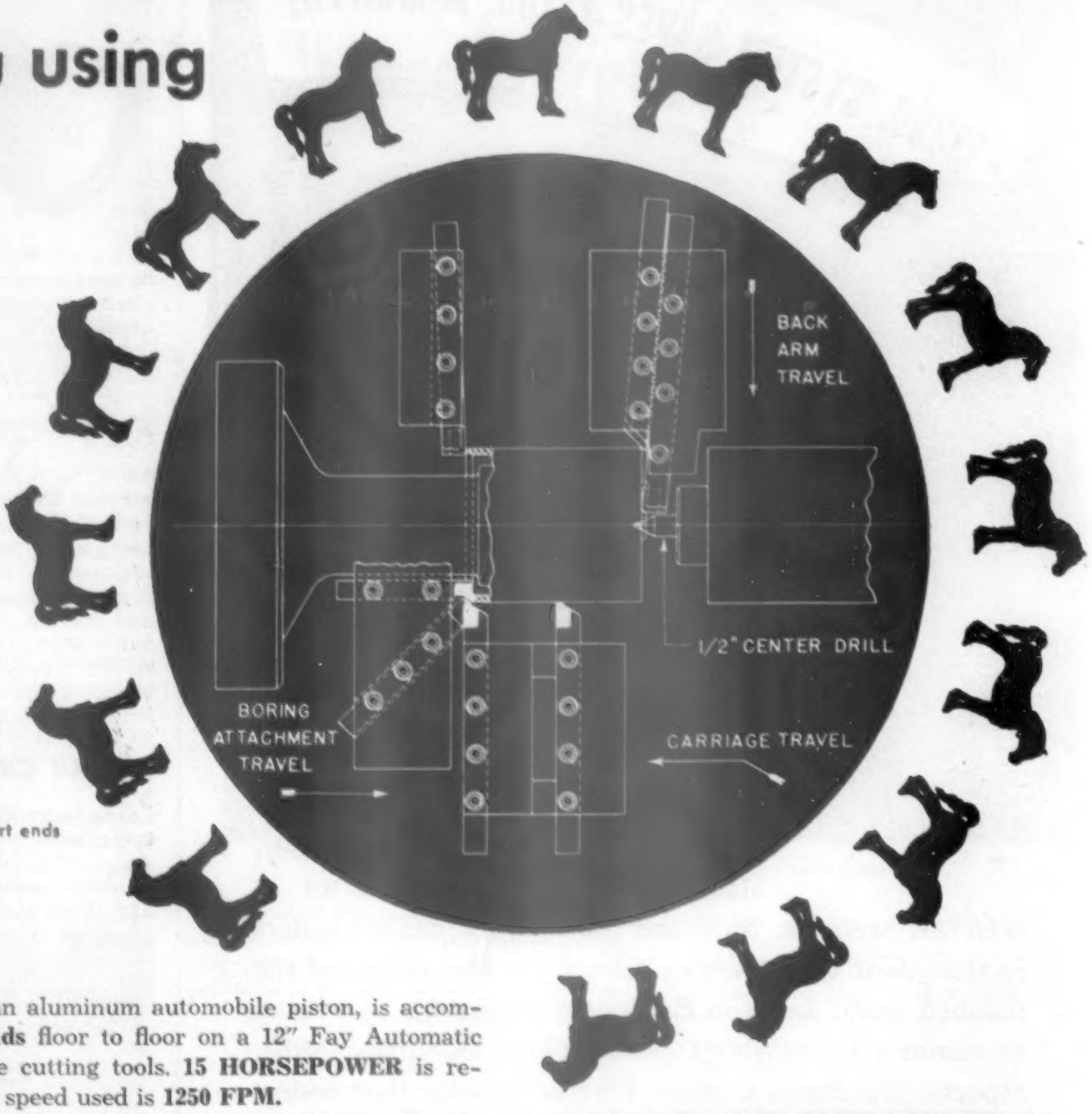
Materials handling box, called Econo-Box, has a carrying capacity of 8000 pounds. It is constructed with an all-welded angle-iron frame and ¼-in., 5-lb. mesh siding and bottom (¼-in.

corrugated steel bottom is optional). Mesh siding allows air to circulate through the box, and facilitates identifying the contents. A 4-in. underclearance is provided for fork lift trucks. United Steel Fabricators, Inc., 1855 Turner Ave., N. W., Grand Rapids 4, Mich.

SAFETY FLASHLIGHT

Named Rub-R-Lite K-2, flashlight has all working parts enclosed in a small sealed-in-head unit, which is "popped" in or out of the steel-lined neoprene case when bulb or batteries are to be changed. Dropping or throwing the flashlight, it is claimed, will not damage it, and submerging it in water or oil cannot hurt it. Resists heat and cold, manufacturer

How much HORSEPOWER are You using ?



1st. Operation on an Aluminum Automobile Piston:—
Rough turn O.D.
Face head and skirt ends
Center closed end
Rough bore skirt
Finish bore skirt
Chamfer skirt

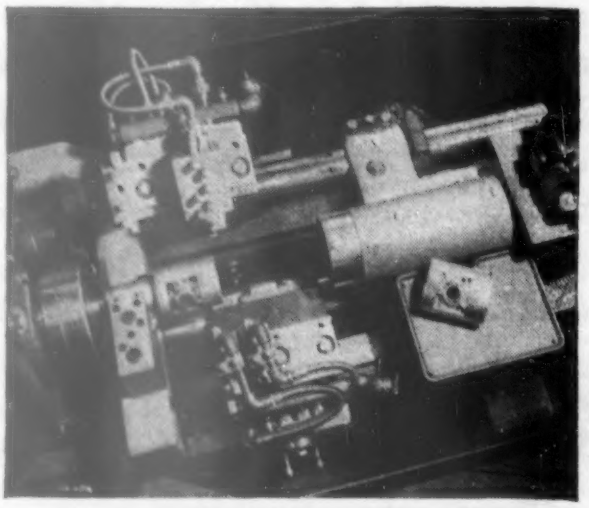
This operation on an aluminum automobile piston, is accomplished **in 15 seconds** floor to floor on a 12" Fay Automatic Lathe using carbide cutting tools. **15 HORSEPOWER** is required. The surface speed used is **1250 FPM.**

Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

Be skeptical of the production efficiency of your metal turning equipment. The chances are that turning accounts for 25 per cent or more of all machining time in your plant—that this is your major production expense.

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the efficient use of carbide cutting tools on Jones & Lamson machines. Our Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of these tools.

Send for our folder "Machining Automotive Pistons." Or better yet, telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.



JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Fay Automatic Lathes* and Universal Turret Lathes •

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$3300. SYSTEM SAVES $1300. A MONTH!

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Dispatch Tubes

enable prominent screw manufacturer to ship orders the day received . . . from an inventory of 30,000 ITEMS!

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"Wings of Business"
Shows How Your Business Can Save!
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● An inventory of 30,000 manufactured items demands a lot of *written records*. So much paper work caused orders in this plant to fall weeks behind the movement of the finished work. Lamson Engineers designed a system of Pneumatic Tubes which speeds orders, inventory forms, reports, and stock transfer slips so rapidly that orders are now filled on the day of receipt. The installation cost of the Lamson System was $3300. Every month it saves the plant $1300. It will continue to pay for itself every 3 months through the many long years of its life.

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Company.....
Address and Zone.....
State.....

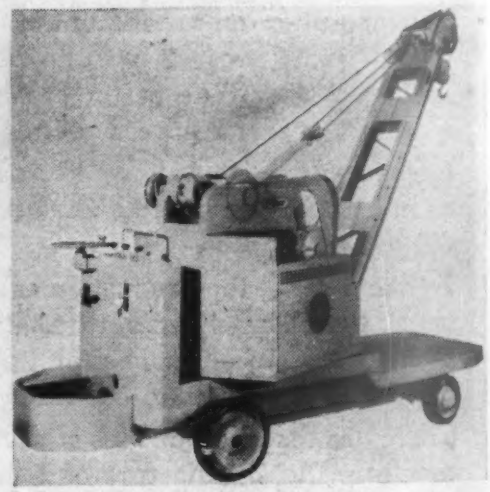
states, and is a non-conductor which can be used around high-powered lines and electrical equipment. No metal parts are exposed, and one-button switch locks in on or off position. Lennan Lights, Inc., 231 West Olive Ave., Burbank, Calif.

AIR SAFETY VALVE

Safety valve for air compressors utilizes a nylon disk working against a bronze seat. Nylon disk is said not to flow or creep under spring compression, nor to stick or weld itself to the seat, but to be flexible enough to conform to the seat and seal off any air leakage after the valve pops. Valve is designed to meet ASME requirements for air compressor service. Manning, Maxwell & Moore Inc., Bridgeport 2, Conn.

MOBILE CRANE

Loads up to 3000 pounds may be lifted, transported, and stacked, by Type CXR crane. The double-reeved hook cable provides moderate speeds when desired, and large platform supports items for transporting any distance. Controls are conveniently located, and safety of



operation is provided by ample visibility, a protecting guard for the operator, and automatic limit stops and brakes for the motors. One handle provides control for forward and reverse. The power axle consists of a hardened and ground alloy steel to bronze wheel in a single reduction. Baker Industrial Truck Div., The Baker-Rauling Co., 2168 West 25th St., Cleveland 13.

TACHOMETER

Extreme speeds of 1 up to 100,000 r.p.m. can be measured by direct coupling with the Type 53 tachometer head, maker says, when used in conjunction with the com-

Improves Production of Generator Housings with "Lincolnweld"

BY R. C. STUPP,
VICE PRESIDENT IN CHARGE OF PRODUCTION
JACK & HEINTZ PRECISION INDUSTRIES, INC.
CLEVELAND, OHIO

PRODUCTION of housings for aircraft generators has been speeded up and improved by use of "Lincolnweld" automatic welding equipment at Jack & Heintz. Previously the parts were manually welded. The new process not only greatly reduces fabricating time, but halves machining time, eliminates costly annealing and sand blasting and improves quality.

Fig. 1 shows component parts of the generator housing—forged end brackets of SAE 8630 steel, Armco center rings and end brackets of SAE 8630 tubing.

First step is to make the longitudinal weld in 8 center rings at a time. The rings are press-formed to a circular shape with an O.D. of 6 5/8". The joint is prepared by machining a 13° angle groove to a depth of 1/16" (see Fig. 3).

Fig. 2 shows the set up for the welding operation. The 8 rings are placed end to end in a fixture which holds them tightly

Fig. 4. Removing completed generator housing from welding fixture.

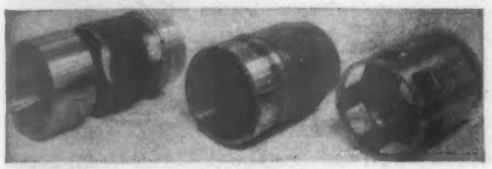


Fig. 1. Component parts of airplane generator housing.

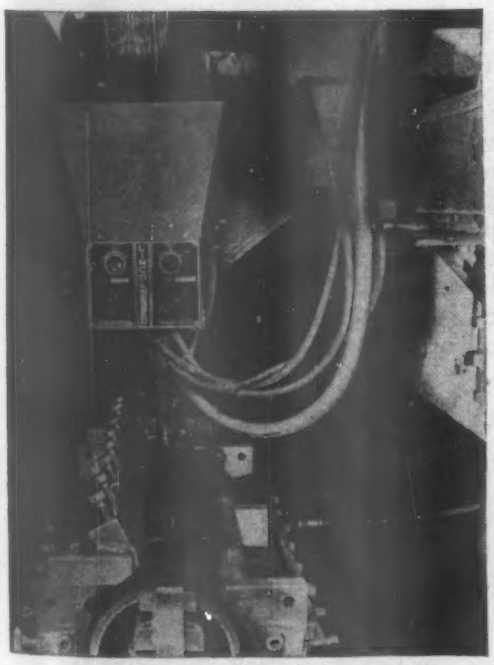


Fig. 2. Eight rings are placed end to end for longitudinal welding.

in alignment with clamp screws and drawbar. The "Lincolnweld" unit travels along the joint and automatically deposits a continuous flux-covered weld at the rate of 12 inches per minute. Penetration is 100%. Bare wire electrode of 1/8" diameter is used. 3/4 pound of wire and 3/4 pound of flux is consumed per foot of weld. The 8 rings are then removed from the jig and broken apart.

The next step is welding of the two end brackets to the center ring by circumferential welds. Edges of the brackets and center ring are machined so that when fitted together they form U-groove joints for welding as sketched in Fig. 5. The three parts are assembled in a fixture with a motor-driven spindle and compressed air-operated drawbar.

In this operation, the automatic welding head remains stationary and the work

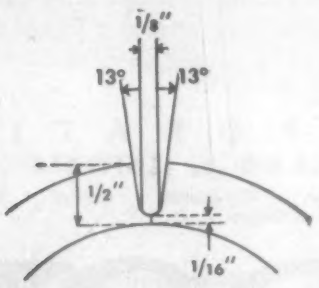


Fig. 3. Preparation of joint for longitudinal weld.

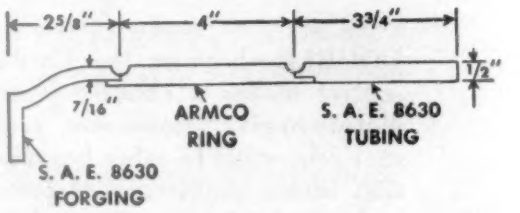


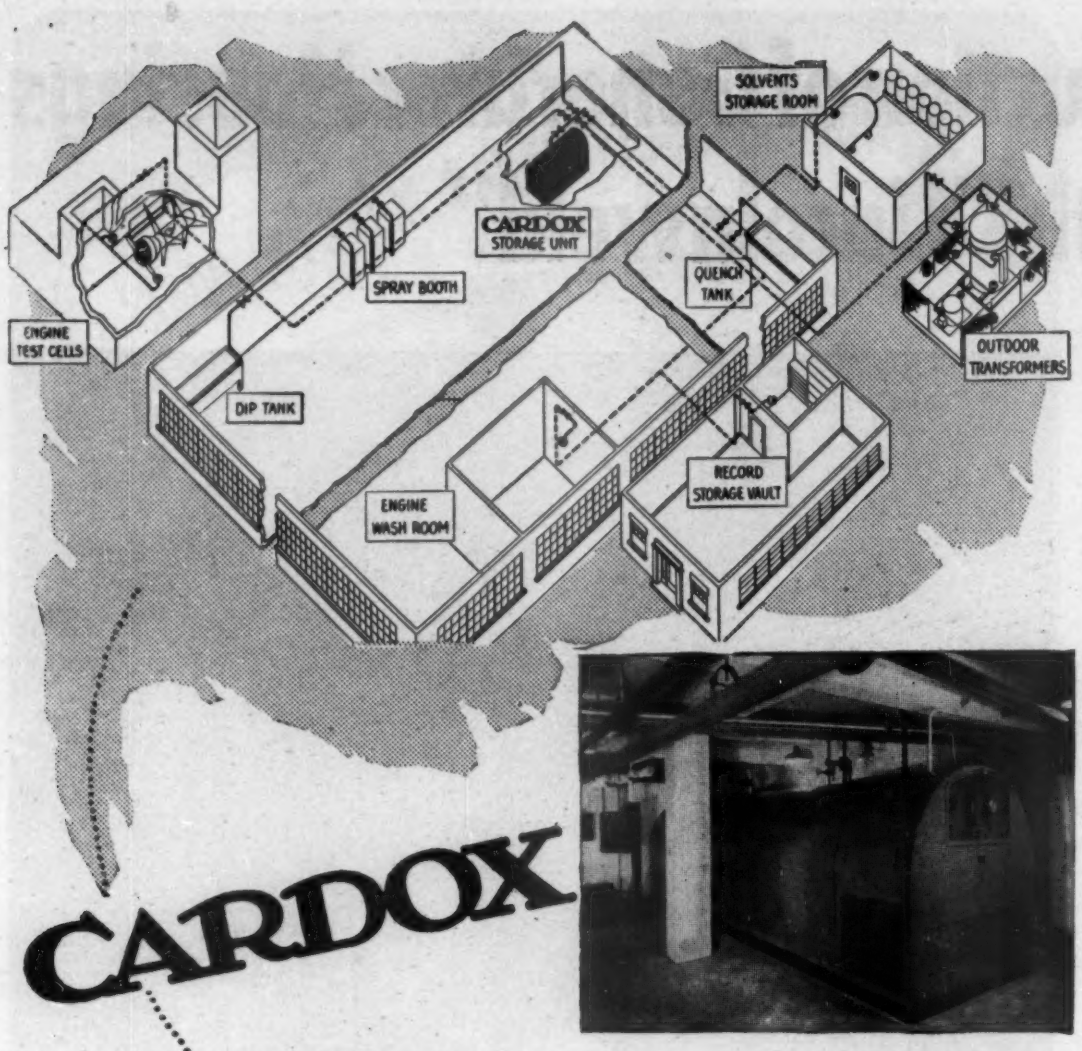
Fig. 5. Cross-section showing how edges of parts are machined to form U-groove joints.

rotates under it, making the welds at the rate of 8 1/3" per minute. Penetration is 1/8 of the thickness of the parent metal. About .3 pounds of electrode and .3 pounds of flux are used per foot of weld, the two complete circumferential welds requiring about a pound of each material. A flux dam is held over the joint in light contact with the work by means of a spring. This dam retains the flux shielding the molten weld metal and permits it to solidify as the work revolves during the welding process. The flux dam set-up makes it possible to produce dense, uniform welds with one pass despite the relatively small diameter of the work.

Fig. 4 shows a generator housing being removed from the fixture after completion of circumferential welds.

Welds made by this process have high physical characteristics, passing rigid X-ray, magnafluxing and torque tests.

The above is published by LINCOLN ELECTRIC in the interests of progress. Free Bul. 439 on the Lincolnweld process is available. Write The Lincoln Electric Company, Dept. 333, Cleveland 1, Ohio.



CARDOX

GIVES DOUBLE PROTECTION FOR TOUGH FIRE HAZARDS

DOUBLE—because the Cardox method of engineered application and control makes it entirely practical to provide enough fire-killing carbon dioxide to give "*double-shot*" safety to the largest hazard protected, multiple shot protection to other hazards covered by the system. This *ample reserve* that means uninterrupted protection *after* fire has been extinguished is a recognized principle of sound Cardox fire engineering.

DOUBLE—because *mass* application of Cardox CO_2 in *pounds* or *tons* means less fire damage. Burning time is cut to a minimum. Non-damaging carbon dioxide cannot harm costly equipment or material in process. There is no after-fire clean-up to cause costly production delays.

Cardox Fire Extinguishing Systems use low-pressure carbon dioxide—stored at 0° F. and relatively low pressure in a single, compactly designed, centrally located Storage Unit that holds from ¼ to 125 tons. The Cardox method of application and control and Cardox engineered equipment have broadened both the performance and protection scope of carbon dioxide—providing *all* the proved advantages of CO_2 extinguishment for tough fire hazards, single or multiple, large or small, indoors or out.

Why not determine for yourself whether this broadened application of carbon dioxide by Cardox Systems or mobile equipment may not be the most effective answer to the fire problems that concern you? Write for Bulletin No. 911

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BELL BUILDING • CHICAGO 1, ILLINOIS
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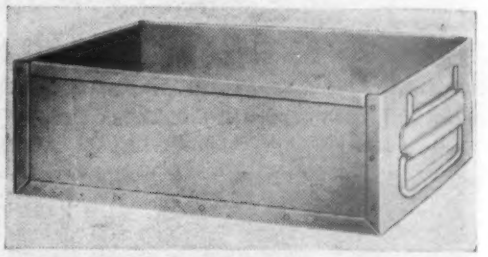
CARDOX
CO_2 FIRE EXTINGUISHING SYSTEMS

pany's electric tachometer indicators Direct linear speed measurements also are obtainable down to a fraction of a foot per minute. Continuous operation up to about 75,000 r.p.m. is practical. A speed changing gear drive is built in the head. Gears are steel and self-lubricating plastic. Easily mounted, tachometer head can be operated in any position. Indicator connections are made through ½-in. conduit to inside terminals accessible by cover plate on rear. Metron Instrument Co., 432 Lincoln St., Denver 9.

STEEL SHELF BOXES

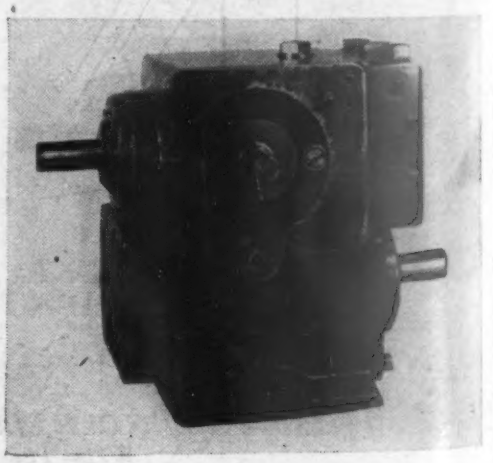
Bolts, nuts, screws, or small bulk parts can be stored in shelf boxes made of steel. Plain, straight sides allow compact arrangement, and smooth surface pre-

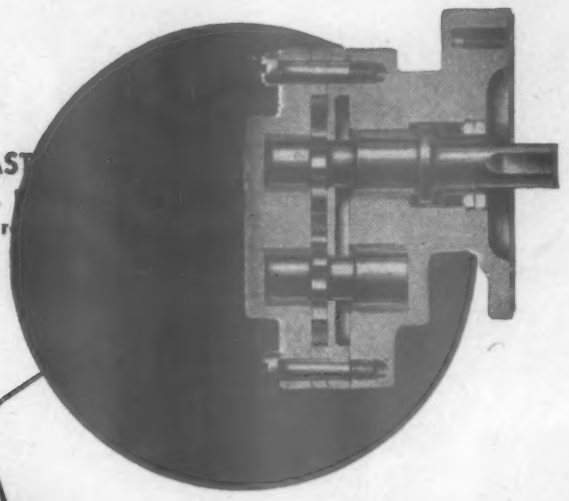


vents boxes from sticking to the shelf or to each other. Label holder on front facilitates identification of contents. Made to fit standard shelving. Bay Inc., 1541 West Indiana Ave., Philadelphia 32.

VARIABLE SPEED TRANSMISSION

Model T-1 hydraulic transmission provides variable speeds from zero, or neutral, to full electric drive motor speed, forward or reverse. The multiple piston, constant torque type unit is rated up to one horsepower, and has output torque of 52½ pound-inches maximum. Self-contained transmission does not require separate oil sump or reservoir tank.





FLOW-MAST
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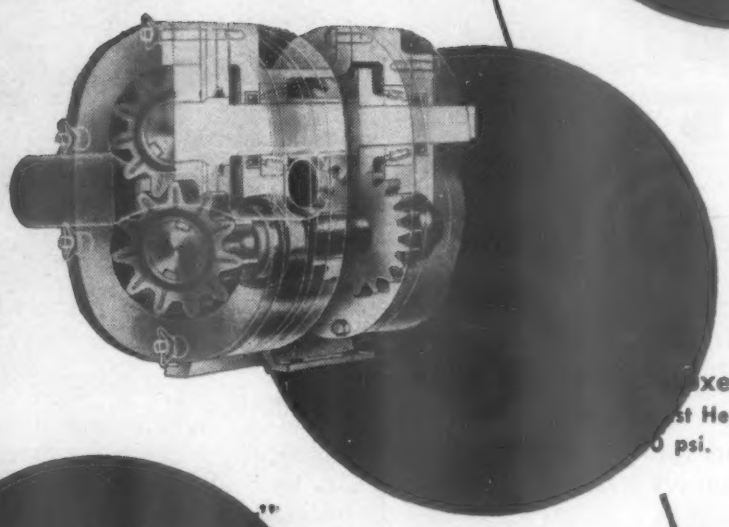

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FLOW-MASTERS are the precision stainless PUMPS that . . .

LAST LONGER because the rotors are hydraulically balanced to eliminate severe metal-to-metal contact. The design also incorporates a unique automatic wear control feature, so that FLOW-MASTERS maintain volumetric efficiency longer against normal wear which must inevitably occur.

METER with EXTREME ACCURACY. They are precision pumps of an entirely new design.

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ARE SANITARY and EASY TO CLEAN so that changeover from product to product can be accomplished quickly and easily.

These and other features make FLOW-MASTERS the finest stainless pumps available to American Industry. For more information, and for details on the Marco Dealer Franchise, write Marco Company, Inc., 13 Third Street, Wilmington 50, Del.

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Equipment For The Process Industries

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IS ONE THING
CUTTING PRODUCTION COSTS
IS ANOTHER

HANSEN
COUPLINGS
DO BOTH

Connections and change-overs become a matter of seconds when you use Hansen Couplings. That means time and money saved with no hold-up of costly operations.

Hansen couplings are toughly constructed for hard abuse, yet carefully and simply designed for finger-tip control. Merely insert plug in socket and coupling is connected; a slight pull on the sleeve and it is disconnected. No twisting or manipulating of parts, no leakage. Complete swivel action prevents kinking of hose. Made for air, oil, grease, oxygen and acetylene to handle pressures from ounces to 10,000 pounds.

Write for folder describing Hansen couplings for industrial uses.

AIR, OIL— GREASE COUPLING

ACETYLENE COUPLING

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STEINHAGEN AIRLINE PRODUCTS, Dayton, O.

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THE HANSEN MANUFACTURING CO.
1786 EAST 27th STREET • CLEVELAND 14, OHIO

lever, or remote controls. Sizes 9½x11x7 inches, with shafts ¾ inch in diameter. Portman Machine Tool Co., 70 Portman Rd., New Rochelle, N. Y.

WHEELED RACK

Utilities racks, in two-, three-, and four-shelf units, are quipped with four casters —two swivel and two rigid. All-metal wheels or molded-on rubber tires are available. Of welded steel construction,

the rack shelves are furnished with flanges up or down, as specified. Standard four-shelf model is 30x48x54 inches over-all, with 12-in. clearance between shelves. Three-shelf model is 24x36x42 inches, with 12-in. shelf clearance. Two-shelf model is 20x32 inches, with 19-in. shelf clearance. Palmer-Shile Co., Dept. K, 16007 Fullerton Ave., Detroit 27.

LEATHER CUP PACKING EXPANDER

Made of heat-treated, corrosion-resistant, berylium copper, leather cup packing expander is in strip form. Can be cut to measure. Designed to maintain constant contact between packing seal lip and cylinder wall on pneumatic and hydraulic equipment, it fits any cup diameter 2 inches or over. Said not to increase friction or wear on packing or walls of cylinder. HPL Manufacturing Co., 2013 East 65th St., Cleveland 3

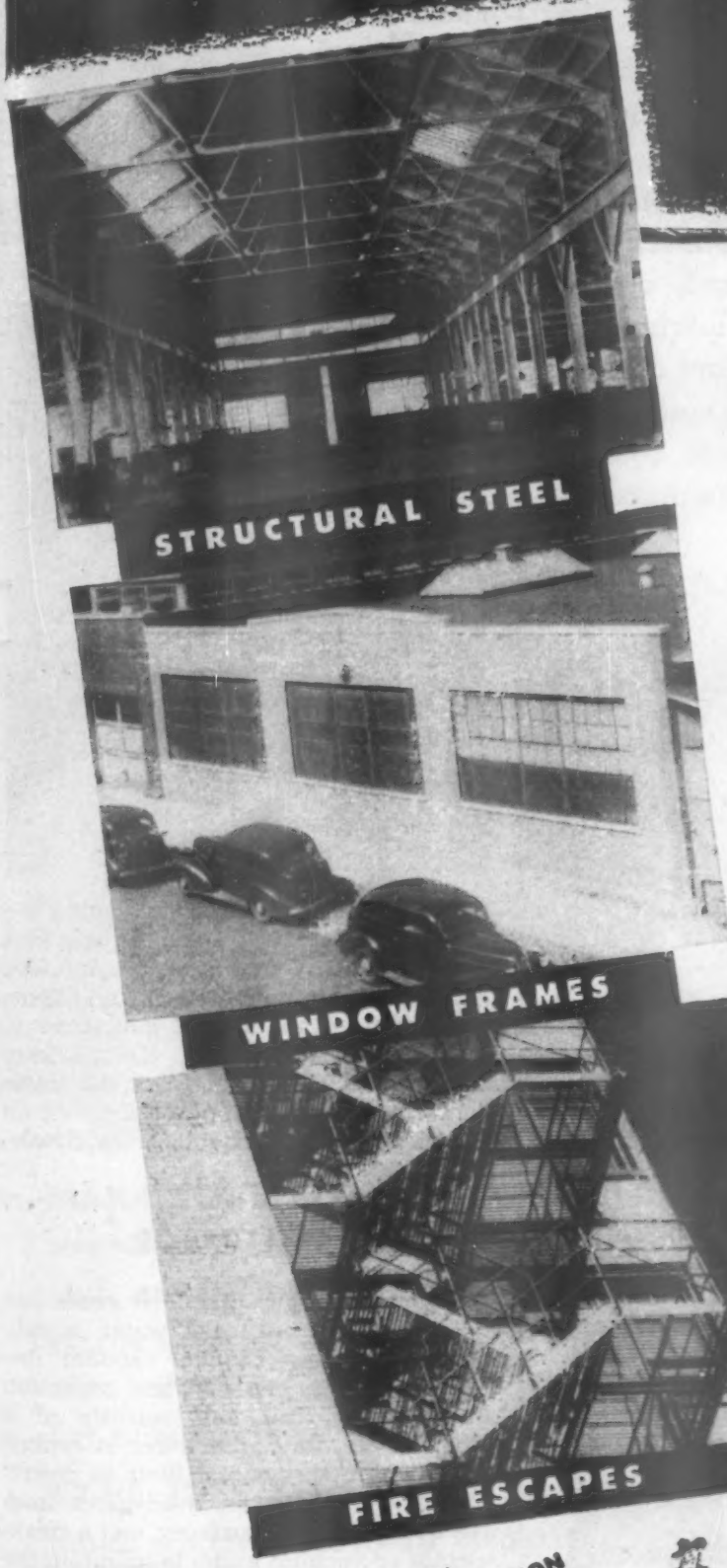
MOTOR CONTROLLERS

"A" series 1-hp. motor controllers, for medium industrial equipment, are furnished in four switching arrangements—reversing, two-speed, series-parallel, and 3-pole off-on. Case, handle, and con-

RUST-OLEUM

THE MODERN RUST PREVENTIVE

Cuts Maintenance Costs 3 Ways



1 ITS PROTECTION LASTS LONGER!

As a protective coating, Rust-Oleum lasts two to ten times longer on most jobs. This means much longer intervals between applications—at a proportionate saving in labor.

2 LESS PREPARATION IS REQUIRED

No sandblasting or chemical cleaners are necessary. Wirebrushing removes scale, blisters, dirt, etc. Rust-Oleum penetrates every pore of the metal and merges the remaining rust into the protective film.

3 RUST-OLEUM GOES ON FASTER

It saves 25% of the time ordinarily required for application and covers 30% more area than ordinary materials—an important saving. Rust-Oleum dries in from four to eight hours, according to job conditions.

Use by industry—*under the worst possible weather and industrial conditions*—proves conclusively that Rust-Oleum STOPS AND PREVENTS RUST. It provides a tough, pliable, waterproof coating that seals surfaces against destruction. Moisture, fumes, heat, smoke and similar damaging elements, alone or in combination, cannot penetrate Rust-Oleum to attack metal.

Nothing is comparable to RUST-OLEUM as a positive money-saving rust preventive. *For years it has been saving money for American industry.* For greater maintenance economy—investigate Rust-Oleum NOW. *Ask your distributor or write today for Catalog of recommended applications.*

EASY TO USE
LASTING PROTECTION

APPLY BY BRUSH,
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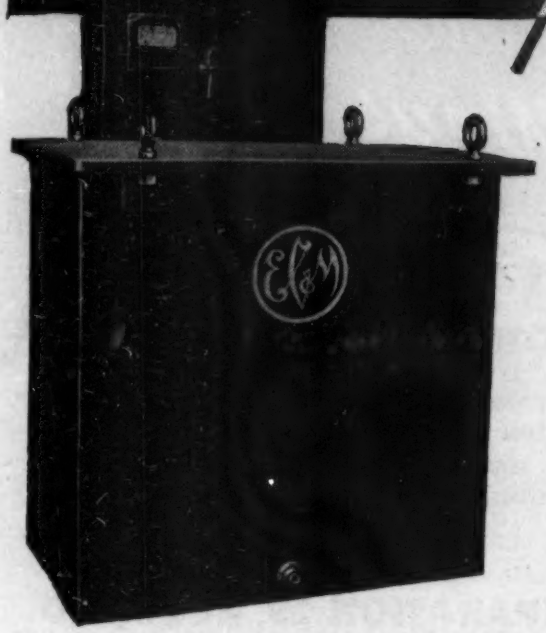
RUST-OLEUM CORPORATION

2437 Oakton Street • Evanston, Illinois

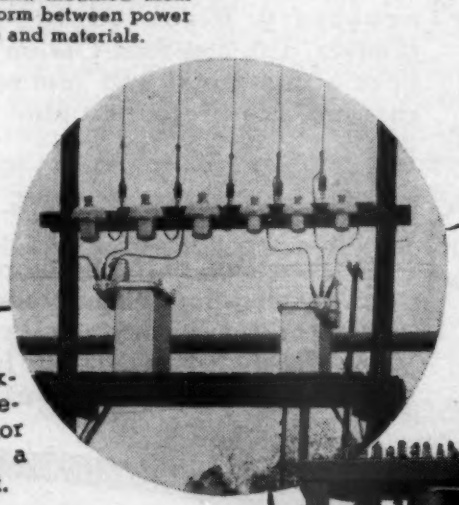
Automatic Starters
for 2300 Volt Motors
by EC&M



Prominent oil refinery selected EC&M 2300 volt Starters and mounted them out-of-doors on platform between power oles . . . saved time and materials.

Complete enclosure of all high voltage parts not only provides a *shock-proof* installation but reduces time and material in installation. With the mechanism totally oil-immersed, operating parts are always lubricated and also protected from corrosion. Push button operation brings the motor up to speed with greater skill than human hands could do it.

Ask for Bulletin 1047-C.



1 Single, quick-break, double-throw contactor operated by a single magnet.

2 Two liberally-rated auto-transformers marked T_1 and T_2.

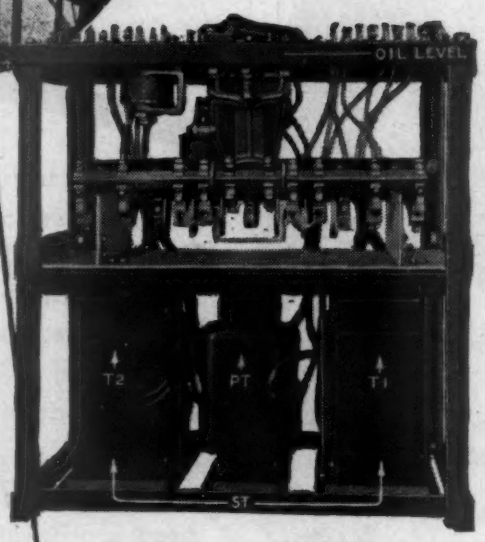
3 Potential transformer (marked PT) for 220 volt push button circuit.

4 Current limit relay trips mechanical latch to transfer from reduced to full voltage.

5 Variable reactor on top of mechanism permits quick change of transition-setting, when desired.

6 Continuous torque acceleration.

7 Adjustable, magnetic type overload relays, arranged for magnetic reset from push button.



Note clean-cut design of this reduced voltage starter mechanism for 2300 volt motors.

THE ELECTRIC CONTROLLER & MFG. CO.
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tact rotor are made of plastic. Several mounting arrangements are available, such as an angle bracket, flange mounting plates, and plates, for attachment to several types of standard outlet boxes. Controller is rated at (1) 1 horsepower for single- and three-phase service at 110 to 550 volts a.c., (2) ¼ horsepower for 115 to 230 volts d.c., and (3) for non-inductive loads at 10 amperes for 110 volts a.c., or 5 amperes for 220 volts a.c. Furnas Electric Co., 426 McKee St., Batavia, Ill.

SAFETY GOGGLE

Rubber-frame safety goggle protects the wearer on jobs in hot and humid atmospheres where chemical and dust hazards exist. Nosepiece has an inhalation and

exhalation valve to prevent fogging and steaming of the large acetate single lens. The 705 "super-vent" goggle safeguards against chemical splashes, spray, impact of foreign particles, and exposures to fine dust concentrations. Molded from non-irritating natural rubber, the frame conforms to facial contours, giving an airtight fit. American Optical Co., Southbridge, Mass.

VACUUM DE-AERATOR

Oxygen and other dissolved gases can be removed from cold water supply systems by the Liquon vacuum de-aerator, to prevent rust and corrosion in pipelines. The unit consists of a chamber in which the water is broken up into thin sprays and films to permit the release of the dissolved gases from the exposed water surfaces, and a steam ejector or vacuum pump to maintain the necessary vacuum corresponding to the boiling point of the water at its comparatively low temperature. Liquid Conditioning Corp., 114 East Price St., Linden, N. J.

OIL REFINER

Small, portable, automatic oil refiner is claimed to remove all impurities from all types of dirty lubricating oil in 20 minutes, for less than 20 cents a gallon. Handling 3½ gallons per batch, it has a

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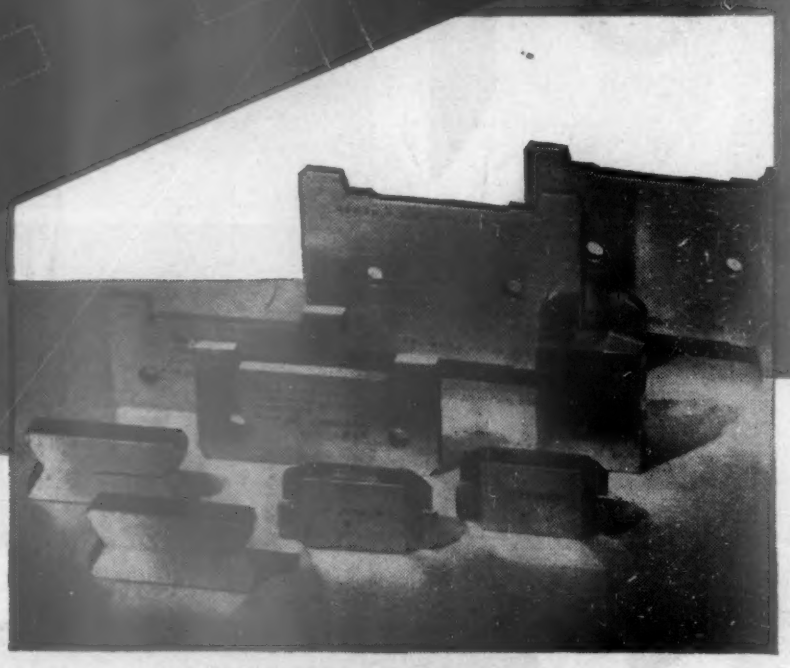

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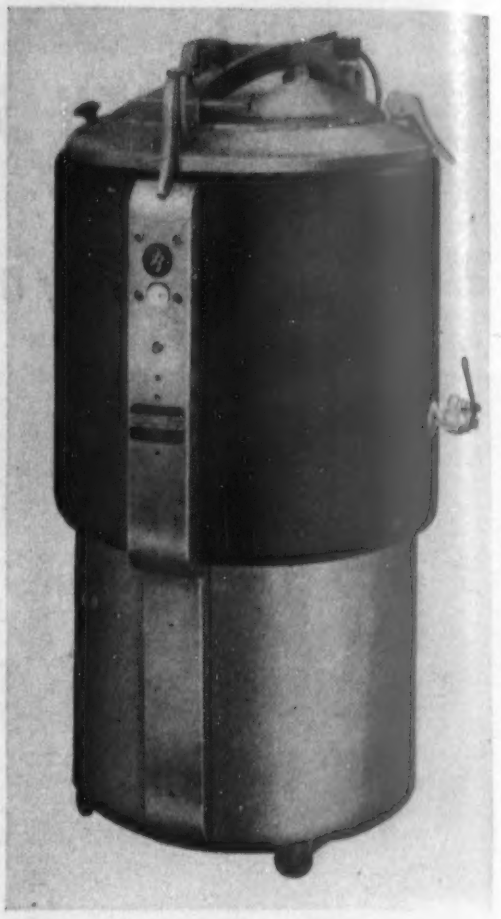
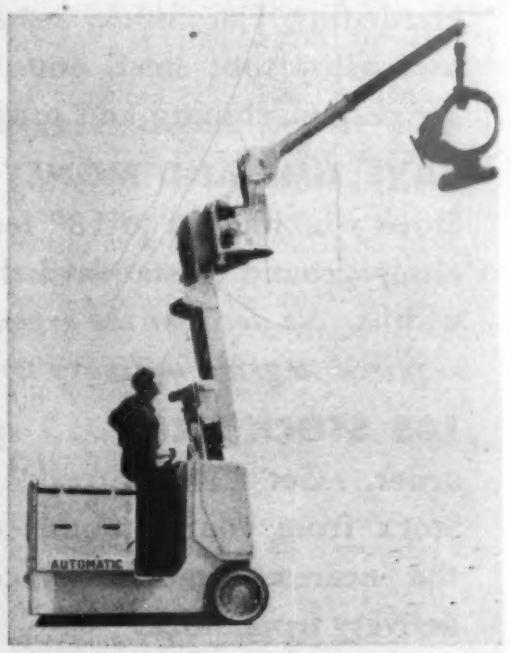


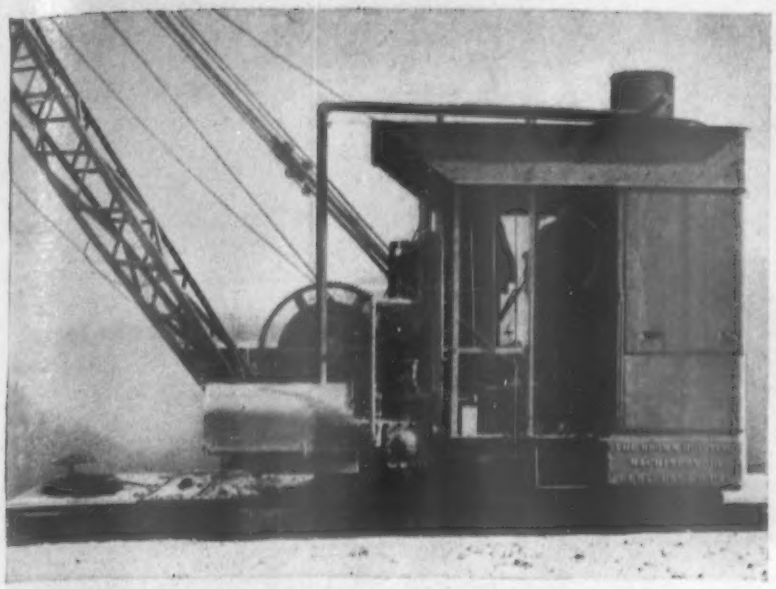
capacity of nearly 90 gallons per 8-hour day. The oil refiner utilizes a low-cost catalyst and filter. A pushbutton starts the process, which is shut off automatically when the batch is re-refined. Removes all foreign solids as well as foreign liquids such as gasoline, kerosene, sulphuric acid, and water. According to the manufacturer, the lubricating quality of the re-refined oil is equal to that of new oil. The machine operates on either 110 or 220 volts, on 60 cycles. The Holden Co., 220 Delaware Ave., Buffalo 2, N. Y.

FORK TRUCK BOOM ATTACHMENT

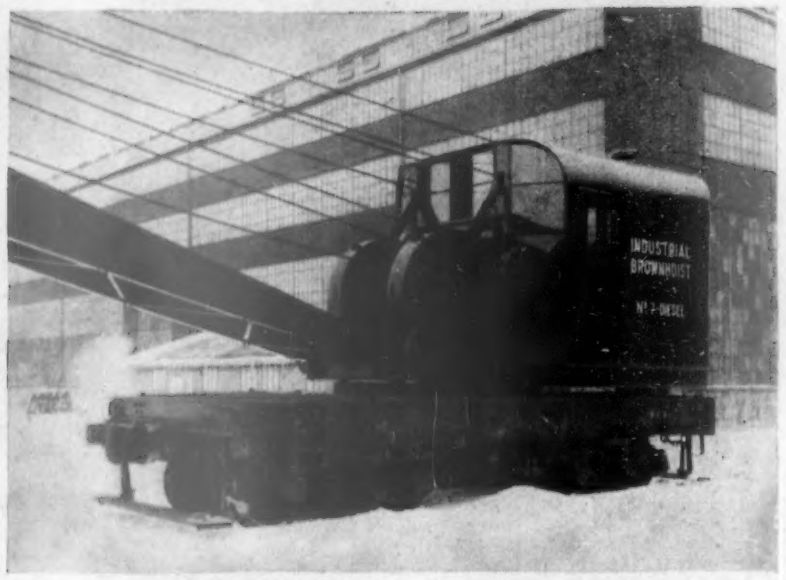
Interchangeable motorized slewing boom attachment permits crane operations with maker's fork trucks. Easily detached, the boom may be replaced by standard forks, ram, or similar attachments. It is manually adjustable in outreach from 54¼ to 108¼ inches, vertically from horizontal to an upward angle



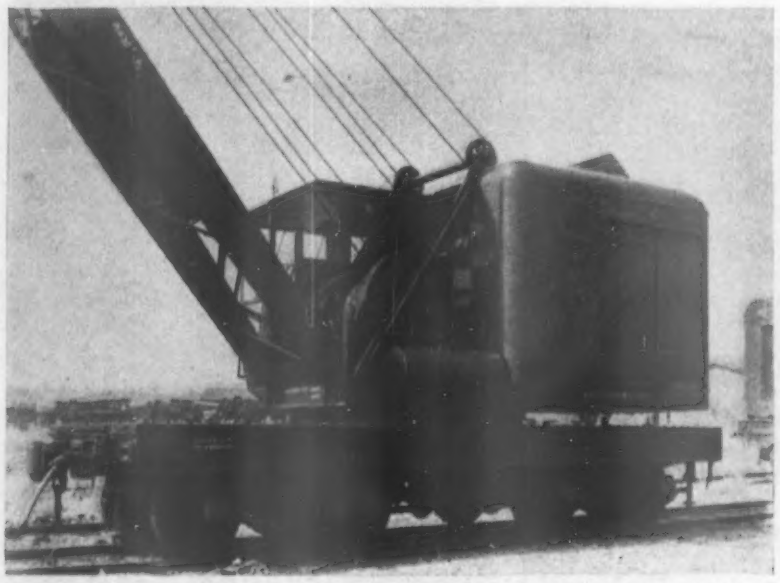
THE *Growth of the Cab* 1907 - 1947



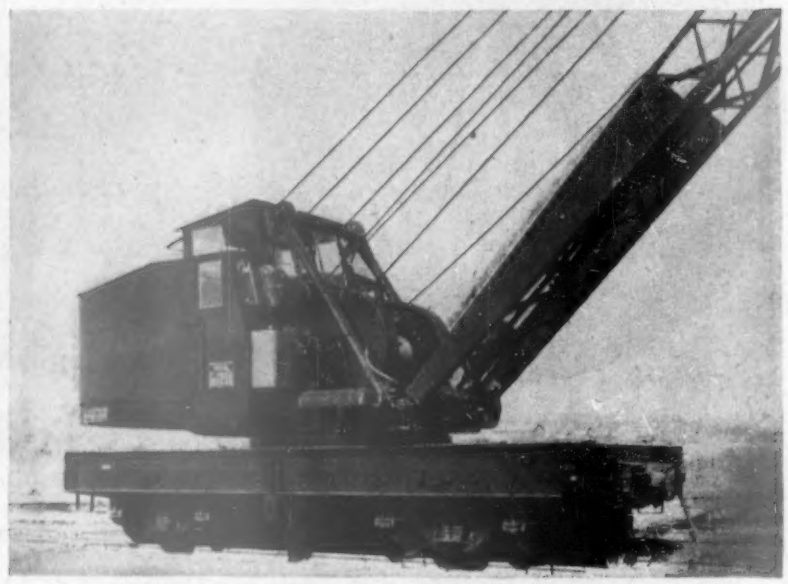
PRIVACY seemed to be the keynote of crane design in 1907. Hardly anyone could see the crane operator, boxed in by cab and caged in by rigging and tools, and *he couldn't see much of anything either.*



BY 1927, glass had caught up with locomotive crane cabs. The Brownhoist trend was to improved visibility, and windows were in vogue. Trouble was, *too much cab was still in the way.*



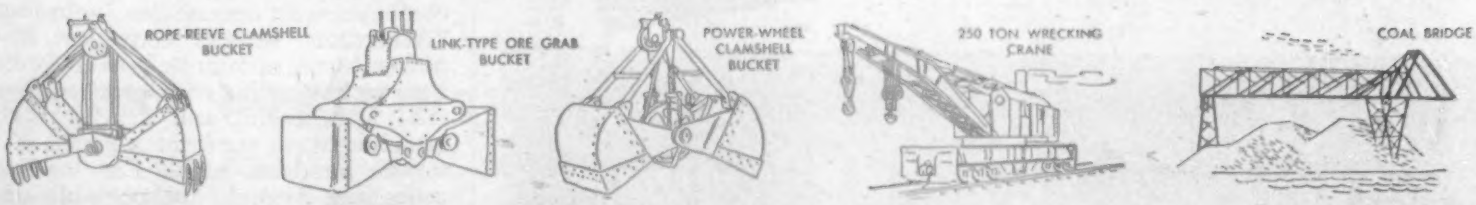
IN 1937, Brownhoist used the side-cab design. It set a new style in crane operation. An *over-the-left-shoulder look* was not only unfashionable—it was impossible.



TODAY, ten years later, 1947, Brownhoist has jolted industry by offering the ultimate in sensible, efficient locomotive crane cab design—the Monitor-type cab that affords the operator *360° visibility.*

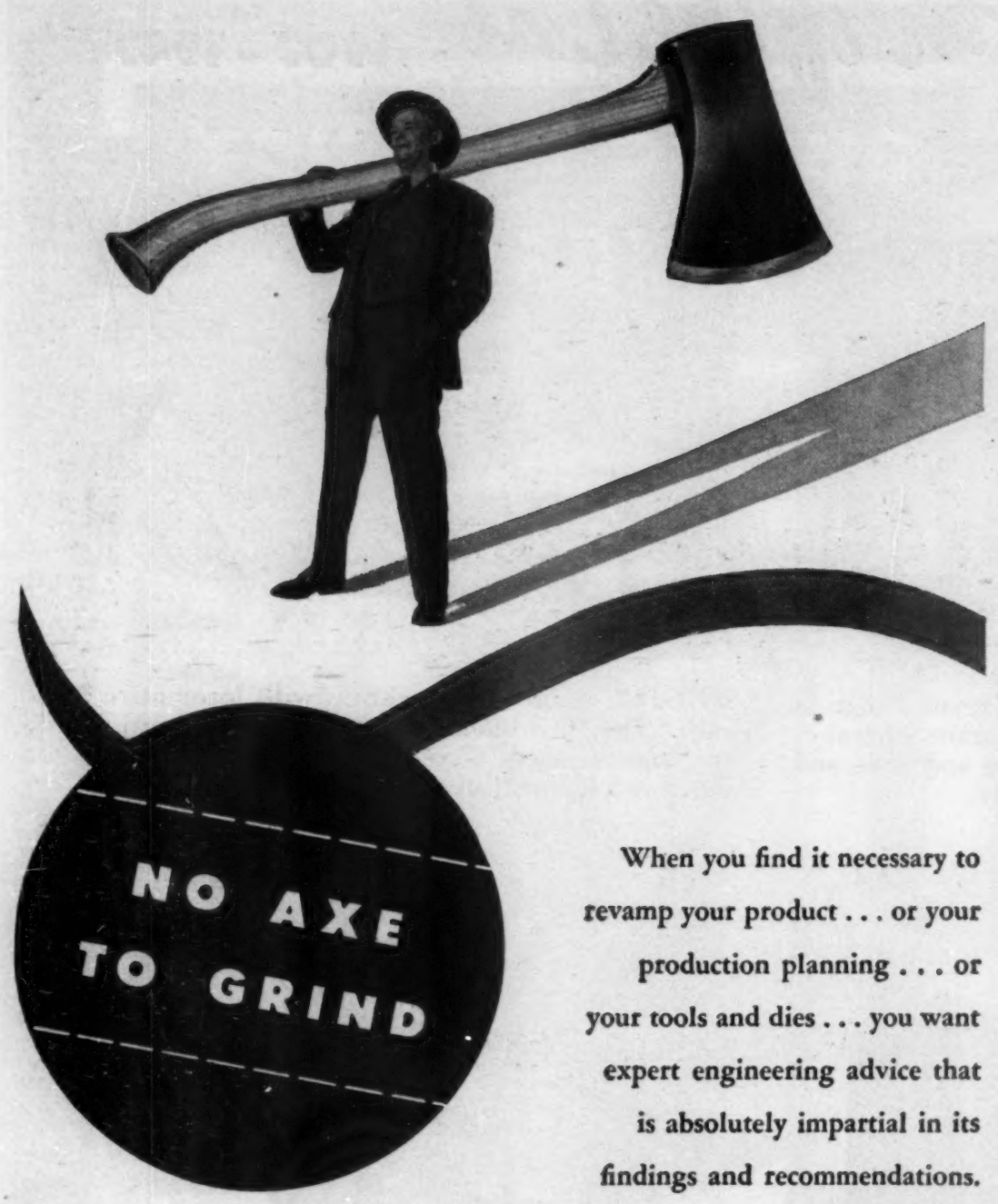
In addition, Brownhoist cranes are equipped with rotating and travel friction disc clutches with one-point adjustment; roller bearings at all essential points; 14″ safety clearance between rotating bed and car body; one-piece cast steel bed; and many other important design and construction advantages. *Write for complete particulars.*

Brownhoist BUILDS BETTER CRANES



INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN

DISTRICT OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO • AGENCIES: DETROIT, BIRMINGHAM, HOUSTON, DENVER, LOS ANGELES, SAN FRANCISCO, SEATTLE, VANCOUVER, B. C., WINNIPEG, CANADIAN BROWNHOIST LTD., MONTREAL, QUEBEC.



When you find it necessary to revamp your product . . . or your production planning . . . or your tools and dies . . . you want expert engineering advice that is absolutely impartial in its findings and recommendations.

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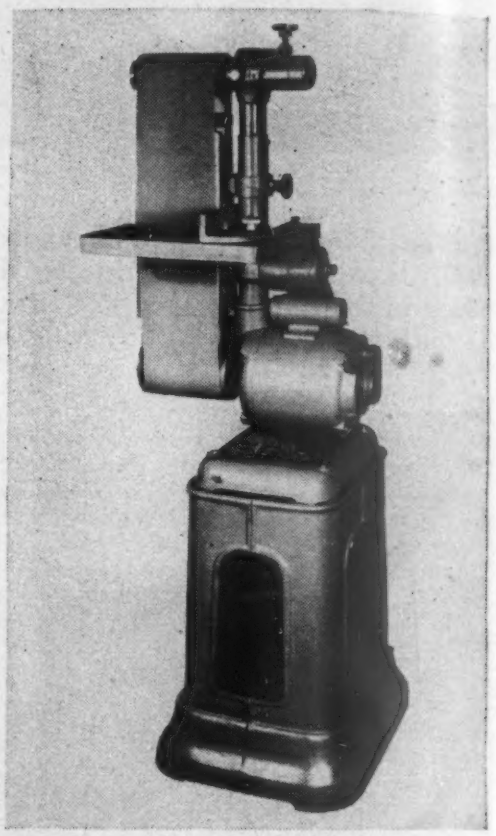
PIONEERing Better Production Methods and Tools

of 30 degrees, and swings horizontally 60 degrees to either side of center. Mounted on standard 6000-lb. capacity fork truck chassis, the boom will handle from 1100- to 1820-lb. loads. Operated by single-reduction slow-speed worm gear unit. Pushbutton controls are mounted on rear uprights in easy reach of operator. Automatic Transportation Co., 149 West 87th St., Chicago 20.

BELT SANDER

Wood, metal, and plastic sanding operations are performed by Type B-3 sander. May be worked with one 6-in. belt, or with two 3-in. belts (one fine and one coarse), 54½ inches in length. In addition to vertical sanding, the



column and belt assembly tilts back for angle-sanding—with the table remaining in horizontal position. When belt is in a horizontal position, the work table is replaced with a parallel fence or cross-belt fence, depending on type of work. The sander is fitted with a direct-drive 3-hp. motor, single- or three-phase. Can be used for spindle-sanding operations on curved pieces with 1½-in. or larger radii. J. D. Wallace & Co., 148 South California Ave., Chicago 12.

PORTABLE POWER CONVEYOR SYSTEM

Unitized portable power conveyor system can be set up or disassembled quickly to handle loads up to 100 pounds per foot. The system is built around a basic power unit made up of a standard 10-ft. straight section powered by a ½-hp., slow-speed motor. The unit combines with accessories, including the "Accordion" gravity conveyor, 90-deg. power turns, automatic power conveyor intersection, piling conveyor base, power feed attachment, and gravity take-off attachment, to perform a range of materials handling tasks. For loading or unloading a truck, the portable unit is assembled as a stacking or piling conveyor. For other types of handling, all units can be combined to operate from several different floor levels, feeding into

Gaylord Boxes

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—and one of great importance

- Corrugated and Solid Fibre Boxes
- Folding Cartons
- Kraft Grocery Bags and Sacks
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Standard of the Packaging Industry

As your finished product rolls off the production line it represents all of your skill and knowledge of precision manufacturing.

Gaylord Balanced Design gives you containers of ample, dependable strength to effect delivery in factory-perfect condition.

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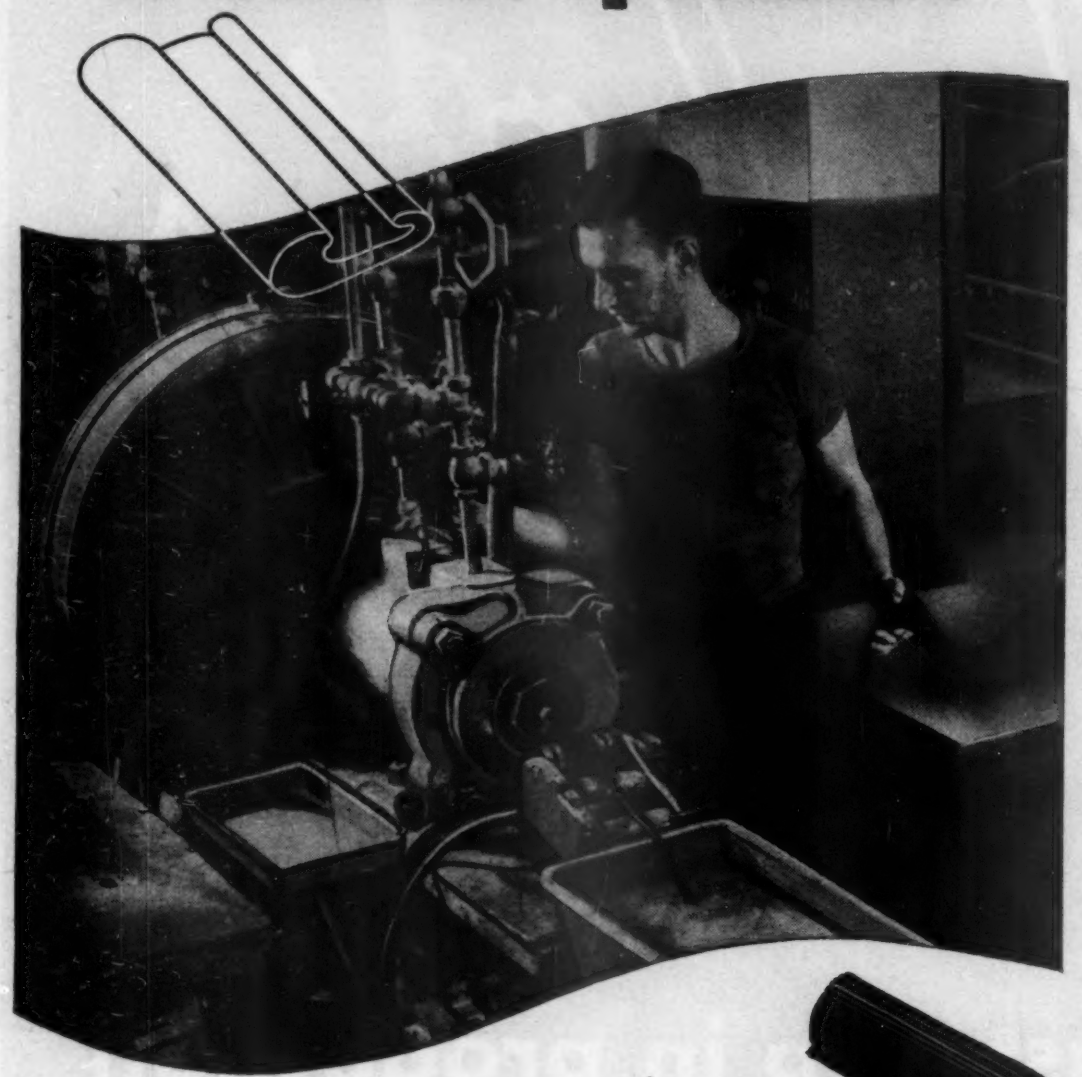
Milwaukee • Chattanooga • Weslaco • New Haven • Appleton • Hickory • Greensboro • Sumter

EXTRUDING RUBBER

is work for Specialists



Continental's specialization is based not only upon its 44 years experience, but also upon the development of specialized equipment. Rubber extrusions are becoming increasingly important as industries design their products for present and future markets. Whenever you have extruded parts to plan and purchase, why not have Continental's recommendation?

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Rubber by **CONTINENTAL**

BRANCHES

Baltimore, Md. · Boston, Mass. · Buffalo, N. Y. · Chicago, Ill. · Cincinnati, Ohio · Cleveland, Ohio · Dallas, Texas · Dayton, Ohio · Detroit, Mich. · Greensboro, N. C. · Hartford, Conn. · Indianapolis, Ind. · Kansas City, Mo. · Los Angeles, Cal. · Lutz, Fla. · Memphis, Tenn. · Milwaukee, Wis. · New York, N. Y. · Philadelphia, Pa. · Pittsburgh, Pa. · Rochester, N. Y. · St. Louis, Mo. · San Francisco, Cal. · Syracuse, N. Y.

•CONTINENTAL RUBBER WORKS • ERIE, PENNA., U.S.A.

one main conveyor line. Food Machinery Corp., Material Handling Div., Riverside, Calif.

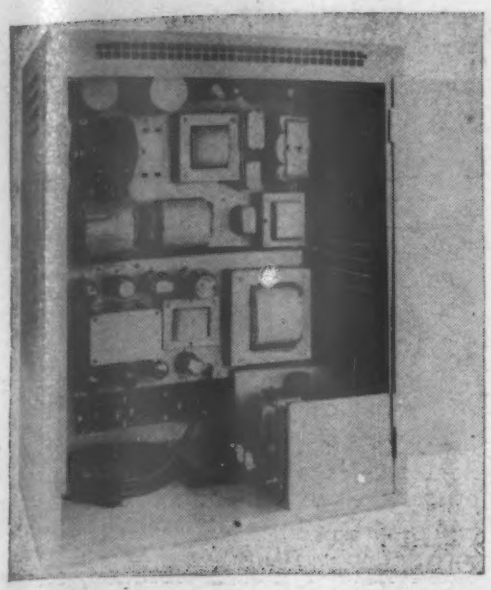
LIGHTING UNIT

Adjustable screw-in hood-shade lighting unit, accommodating up to a 300-watt Mazda-Type R-40 bulb, is available with or without removable louvers. Providing local lighting, it will not work

loose or drop down, regardless of vibration or number of adjustments, maker says. There are no wingnuts or screws to adjust. Has 90-deg. vertical range, 350-deg. horizontal range adjustment. Special "stop" prevents wires twisting. In addition to the standard screw-in type, the units come with screw-in extension pipes in 5-, 8-, and 11-in. lengths. Can be screwed in existing outlets and receptacles. Requires no wiring. Swivelier, Inc., 124 Irving Pl., New York 3.

VOLTAGE REGULATOR

Model E-3006 voltage regulator is designed to provide a stable, precisely regulated source of d.c. voltage and current applicable for testing instruments. Physically the unit is divided in half. The upper half is a modified nobatron with input voltage range, 95 to 125 volts a.c.; output voltage 6 volts d.c.; load range, 7½ to 15 amperes; regulation accuracy, 0.1 per cent; ripple voltage RMS maximum, ½ per cent; recovery time, 0.2 seconds; 50- to 60-cycle input frequency range; and minus 50- to plus 50-deg. C. ambient temperature range. The lower half contains a regulated d.c. power supply with input voltage range



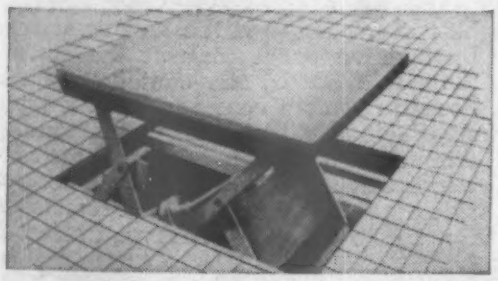
of 90 to 135; output, 0 to 300 volts d.c., continuously adjustable; 100-ma. load capacity; and 50- to 60-cycle input frequency range. Sorensen & Co., Inc., Stamford, Conn.

LEATHER SAFETY MITTENS

Made of plump weight chrome tanned cowhide, mittens are said to take on a slick, hard, protective surface. The mitt is open at the top, so that when handling lumber particles and chips which might enter at the wrist end can be expelled without taking mitt off. Thumb is seamless across the palm; a folded strip of leather is inserted in the closing seam and then double-stitched with steel, preventing splinters from piercing at that point. Reversible, the mitt can be worn on either hand. Industrial Gloves Co., Danville, Ill.

HYDRAULIC LEVELING PLATFORM

Sheets on skids may be elevated on hydraulic leveling platform to height desired for processing. Electric truck can drive right over the platform to deliver the load, when platform is lowered to floor level. As sheets are taken off, the platform may be raised to keep top sheet



at necessary height until the skid is bare. Then platform is returned to floor level. It is actuated by hydraulic power electrically generated and controlled for safety of equipment. A hydraulic valve in the feed line controls raising and lowering. Safety devices prevent overloading and overtravelling. Capacity is limited to 2000 pounds, elevation is 30 inches above floor line, platform is 40x65 inches, and is furnished with toe guards. The electric motor is 1 horsepower, 3 phase, 60 cycle. General Sales & Eng. Co., 7358 North Clark St., Chicago 26.

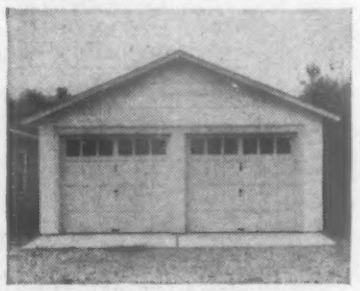
VOLTAGE CHANGE SWITCH

Motor voltage change switch permits universal application of fractional-horsepower motors. Has two positions

Packing Costs Reduced 80%

Commander Door Inc. bundles overhead garage doors with great savings of lumber and labor—using Acme Steelstrap methods

This is the Acme bundling method which saves 80% for this manufacturer! Requires minimum of lumber, time, and labor. A few feet of Acme Steelstrap, some protective wrapping, and the job is done!



The 4 sections of the overhead-type doors in this garage are now shipped as a unit.

More savings ahead for Acme Steelstrap users—No. 3 Steelstrapper, the lightest tool made, is now available. Magazine holds 100 seals. Tensions, seals, and cuts the strap in one operation. Small base requires only 5-inch strapping surface. Two levers working in opposite directions make for better balance and easier handling.

• The Commander Door Inc., Holmes, Pa., used to ship the four sections of its prefabricated garage doors crated by sections.

As production increased, faster methods of bundling these sections became imperative.

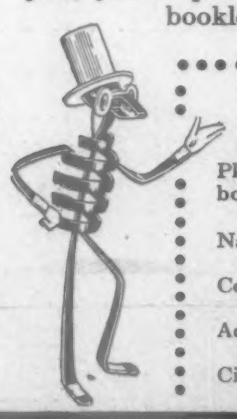
Acme Shipping Specialists recommended packing the whole door as a unit with Acme Steelstrap and protective wrapping.

Now customers receive doors in perfect condition, yet Commander Door Inc. saves 80% of packing costs! Also customers benefit from reduced freight weights.

Ready to Work for You

This case study is not unusual. Acme methods are producing similar results for many leading manufacturers. Why not put them to work for you?

For more information on how Acme can help you, just clip and mail the coupon for the free booklet, "SAVINGS IN SHIPPING."



Acme Steel Company, Dept. FM-97
2838 Archer Avenue
Chicago 8, Illinois

Please send me a copy of your case history booklet, "SAVINGS IN SHIPPING."

Name.....

Company.....

Address.....

City.....Zone.....State.....

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SCHRAMM
"built-in"
motor driven
compressor

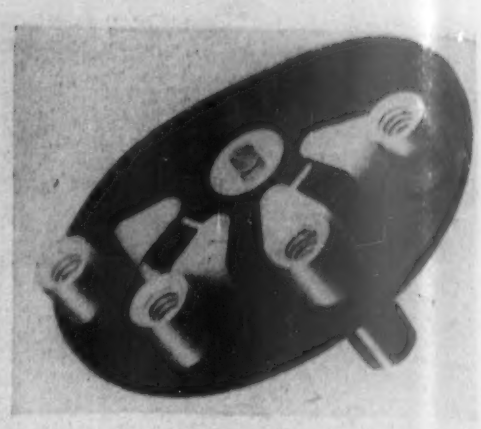
Schramm #710 stationary compressor operating metallizing gun and other pneumatic tools in the plant of the Metallizing Engineering Company, Long Island City, New York.

Reclaiming defective castings . . . a process developed to enable foundries and machine shops to effect a positive repair of defective aluminum castings. May also be used for reclaiming bronze, grey iron, malleable iron, as well as steel castings.

This is only one of the hundreds of different applications of compressed air for industrial and manufacturing plants as furnished by the Schramm heavy-duty, continuous service, built-in motor or V-belt drive compressors ranging from 2½ to 600 cu. ft. displacement.

Write for catalog 45A

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA



for voltage setting—one connecting two field windings in parallel for 110-volt operation, and the other connecting the two windings in series for 220-volt operation. The switch is said to withstand normal motor vibration, and is equipped with terminals that may serve as junctions for the line and field winding leads. The standard shaft is milled to fit 5/32-in. open-ended wrench. The shaft end may be machined to specifications. P. R. Mallory & Co., Inc., 3029 East Washington St., Indianapolis 6.

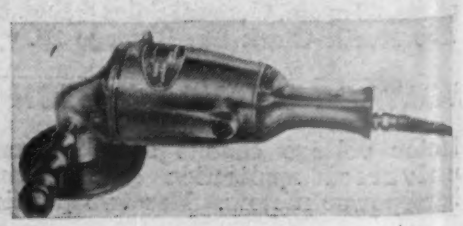
SPRAYGUN STORAGE

When not in use, a number of sprayguns can be kept in a container that is said to provide "freeze-free" storage. Nozzle tip of each spraygun rests in a solvent which is kept at a constant level by a reservoir in the tank. The solvent can

be replenished, and the tank is cleaned by opening drain cock at the bottom. Slots in front of the container permit hoses to remain connected to the guns. Available in different lengths depending on number of guns to be stored, the container can be mounted on wall, post, or side of the spray booth. The Protectoseal Co., 1920 South Western Ave., Chicago 8.

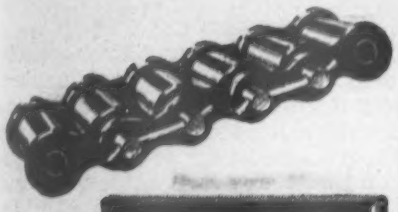
DISK SANDERS

Added to line of Metalmaster portable electric tools, Kool Grip disk sanders and polishers utilize a baffled air intake through rear handle for cooling the motor and tool grip. Use of double reduction gears permits a small spindle gear, and decreases centrifugal force. The tools include permanently lubricated ball bearings, and slide safety thumb switch. The three models consist



Just a Simple Figure "8"

This short length of UNION roller chain is made up of the 28 separate parts shown below.



UNION CHAINS

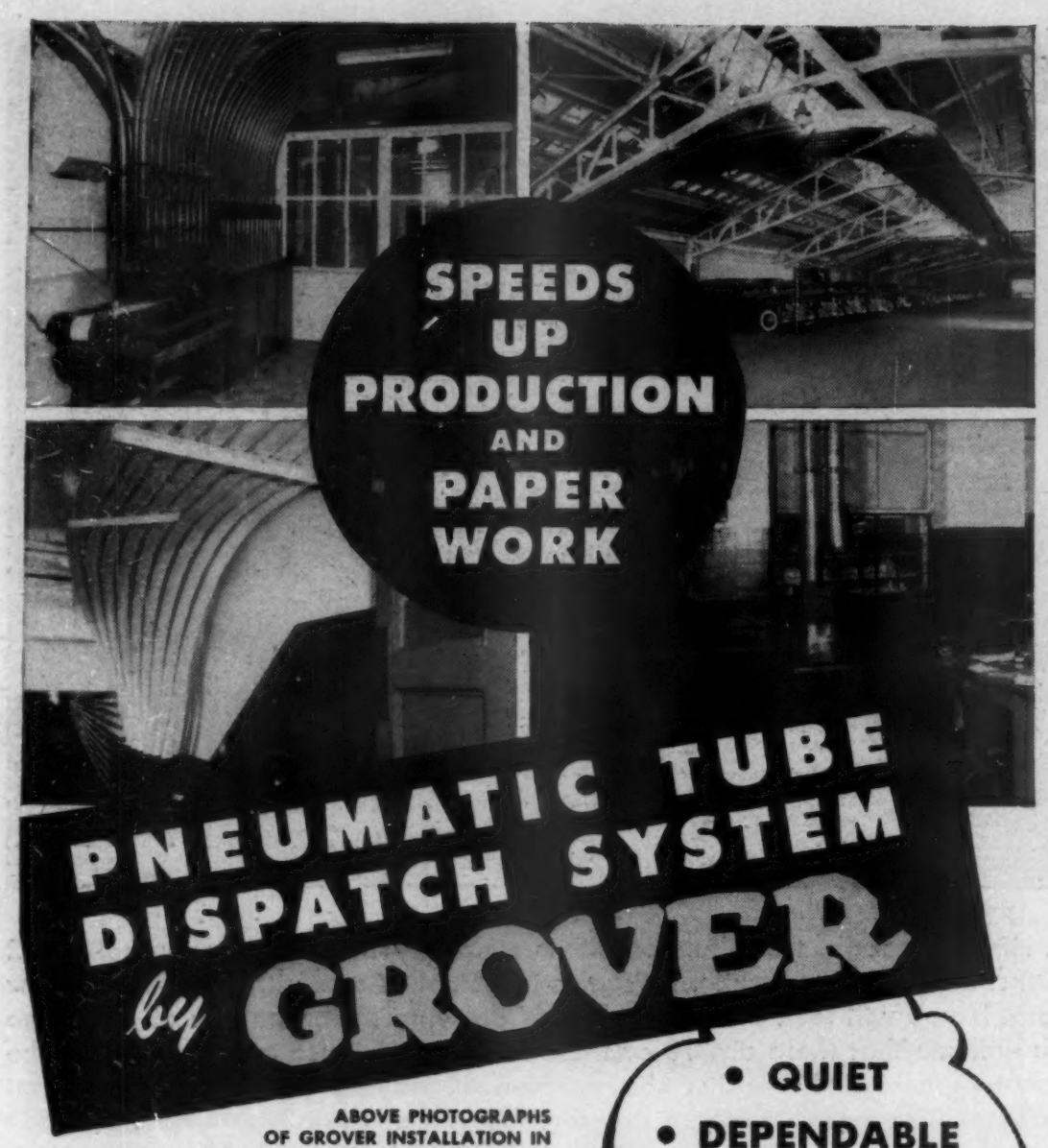
It's simple enough, true—but for all its simplicity its fabrication requires 12 distinct and precise operations. For this is a sidebar of a pitch of UNION roller chain. If you will look at the "exploded" drawing at the bottom of this page you will see that there are 10 of these sidebars (6 inner and 4 outer) in the short length of UNION roller chain shown at the left. You will also see that there are 28 separate parts in this same length of chain. But what you don't see is that it requires 290 operations to make these 28 parts. Nor can you see that every step from receipt of material to finished product is carefully supervised by an inspection department responsible to the engineering division.

Here at UNION CHAIN we make nothing but sprocket chains, sprockets and attachments. All our skill and effort are concentrated on the precision manufacturing of high quality chains of various types for the transmission of power and the handling of materials. We are not yet able to meet the overwhelming demand for UNION chain, but we assure our customers and friends that we are making every effort to do so, consistent always with the character of our product and the complicated processes of its manufacture.

The Union Chain and Manufacturing Company • Sandusky, Ohio

THESE 12 OPERATIONS TO MAKE THIS STEEL SIDEBAR

1. Straighten stock material
2. Pierce pitch holes
3. Blank link contour
4. Coin link edges
5. Stamp name and number
6. Straighten link
7. Broach pitch holes
8. De-grease
9. Heat treat and quench
10. Clean and polish
11. Temper
12. Color



ABOVE PHOTOGRAPHS
OF GROVER INSTALLATION IN
CADILLAC MOTOR CAR PLANT, DETROIT, MICH.

- QUIET
- DEPENDABLE
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Modern mass production technique requires on-the-dot synchronizing of purchasing, delivering, processing and shipping operations. A Grover Pneumatic Tube Dispatch System is the modern way to centralize control. It can do the complete job of keeping the central office in immediate contact with all parts of the plant. This has been proved. Paper work, formulae, small parts, test batches, samples, move rapidly, accurately, privately. Time is saved, errors avoided. The investment is small alongside the many advantages. Ask a skilled Grover representative to look at your plant. There's no obligation.

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of a 7-in. heavy-duty sander, 9-in. standard-duty sander, and 7-in. polisher, having universal 110-volt motor. Bradford Machine Tool Co., Evans & Viaduct Sts., Cincinnati 4.

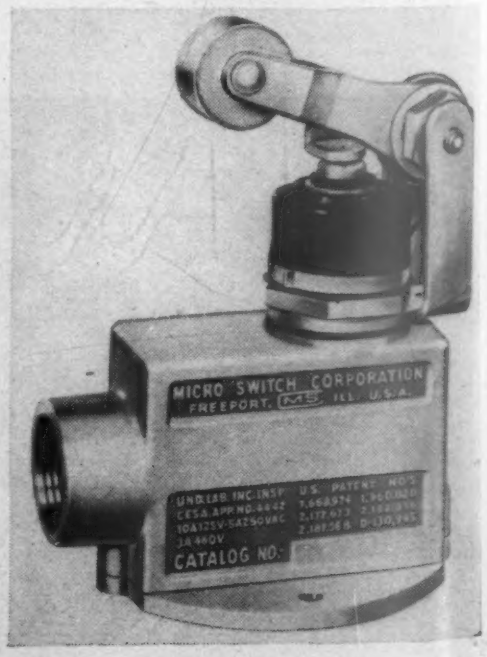
A.C. INERT-ARC WELDER

Type WP 220-440-volt a.c. welding transformer, for both manual and machine operation, is built for use with the inert-arc welding process. Suitable for welding aluminum, magnesium, and beryllium copper in an atmosphere of

argon gas without use of flux, the welder also may be used for other metals and alloys. Built into a single unit are welding transformer, control panel, capacitors for power-factor correction, a bank of series capacitors to stabilize the arc, a pilot spark circuit for arc starting, and water and gas solenoid valves, all enclosed in a drip-proof case. Indicator scale on front of welder shows current setting, which is controlled by a handle on top of the welder. Controls are on panel in the welder, and all components are operated by a foot treadle. Welder can be mounted on a 3-wheel running gear. Electric Welding Div., General Electric Co., Schenectady.

SEALED SWITCH

Sealed precision switch, with adjustable roller arm actuator, is constructed for use in equipment where it is exposed



Condor WHIPCORD V-BELTS

Where high speed and constant operation of machinery are vital to a process, you can't beat Condor Whipcord V-Belts.

In malt production, for example, huge blowers must move air at rates up to 200,000 cubic feet per minute —first, cool humidified air during the germinating process—then hot, dry air to dry the malt after germination.

It is on machinery like this that Condor Whipcord V-Belts deliver their best. Despite the terrific test of short center drives at high speeds, Manhattan's *Flexlastics* dissipate heat and permit the Whipcord Strength Members to give longer service.

Also, the *Flexlastic* cushion in a Condor V-Belt seats it firmly in the sheaves to deliver every possible unit of power to the driven shaft.

Whether your drive is two belts or twenty, make sure you get all "pull" for your power costs by using CONDORS.

(Bulletin No. 6868 B describes 8 acknowledged advantages.)

"Flexlastics" is exclusive with Manhattan

RAYBESTOS R M MANHATTAN

RAYBESTOS-MANHATTAN INC.

Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

Trolley type conveyor carries washing machine agitators to grinders and buffers. Roller conveyor moves them away.

A-F *ENGINEERED* CONVEYORS
GIVE SPEEDIER, ECONOMICAL
MOVEMENT
TO PRODUCTION

Why Be Satisfied With Less?

THERE IS NO CONGESTION in your plant when efficiently conveyorized production lines like these move in a steady endless stream by means of an A-F *Engineered* and Completely Co-ordinated Conveyor System!

Many factories—large and small—have proved beyond the shadow of a doubt that an A-F *Engineered* completely co-ordinated conveyor system reduces handling costs in *every department from unloading to shipping.* If YOU have a products handling or materials handling problem that is beginning to worry you, why not let us discuss it with you? Write today—no obligation—and let us show you how an especially engineered conveyor system can be fitted into your plant layout for greater operating efficiency!

THE ALVEY-FERGUSON COMPANY

Established 1901

139 Disney St. — *Offices in Principal Cities* — Cincinnati 9, Ohio

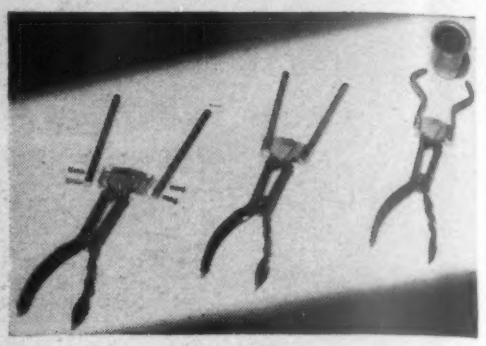
Export Department, Cable Address "Conveyor"

CONVEYING EQUIPMENT
Alvey-Ferguson
METAL PRODUCTS CLEANING EQUIPMENT

to dust, dirt, abrasives, and the occasional splash of oil and water. The Type N2 die-cast switch is for cam and slide actuation. The roller arm actuator is adjustable vertically and horizontally. The switch is supplied for either bottom or side mounting. Synthetic rubber boot covers the operating plunger and the gasket assembled between the bottom plate and the housing case, sealing the switch unit, when the conduit hub is fitted with rigid conduit. Micro Switch, Freeport, Ill.

PUNCH PRESS PLIERS

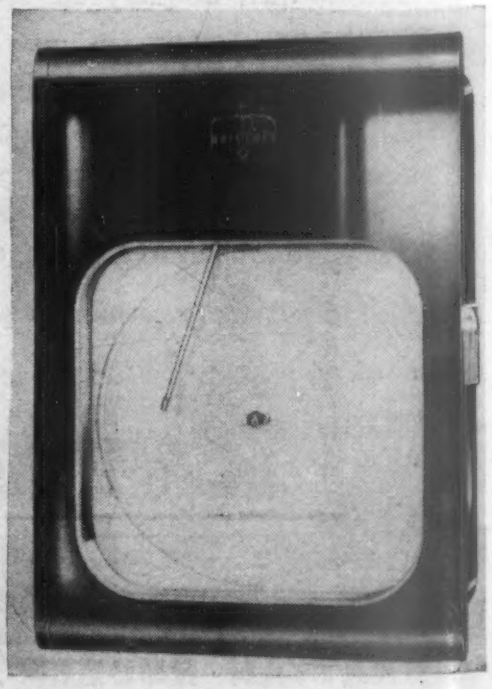
Lightweight hand-fitting plier provides protection for press operators and dies. Toggle-action multiplies leverage, provides firm grip with minimum fatigue.



Jaws are soft aluminum alloy straight bars, and can be shaped cold in the plant to accommodate the part to be handled. The jaws will not damage the dies, and are replaceable if smashed, or if a different shape is required. Plier weighs less than 6 ounces. Universal Safety Equipment Co., 2921 North Cicero Ave., Chicago 41.

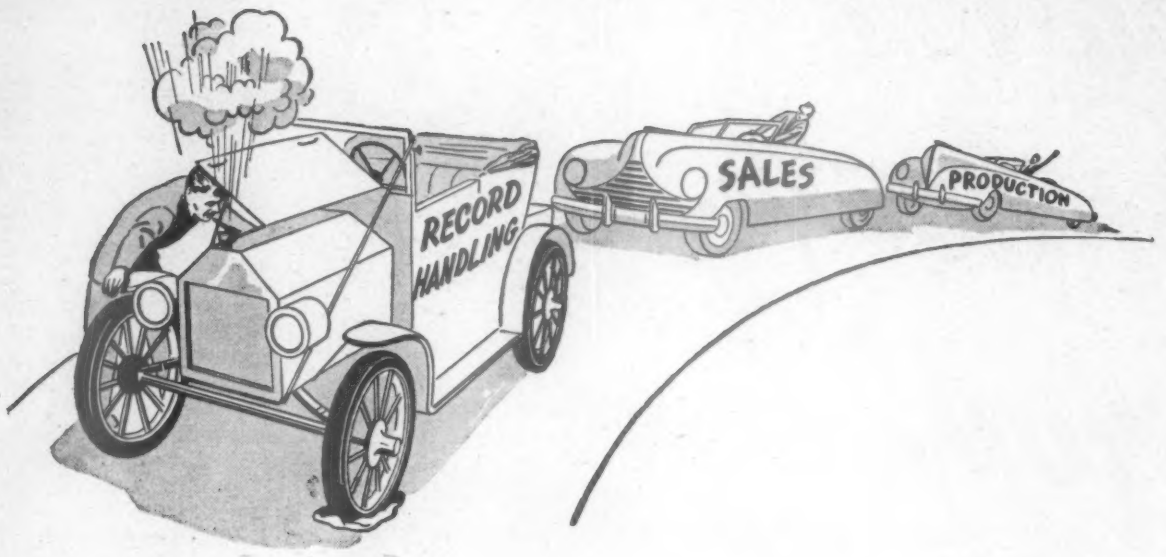
THERMOMETERS AND GAGES

Series 500 recording thermometers and recording gages, operating on the same basic principles as previous models, are redesigned to simplify use, construction, and servicing, manufacturer says. Mounted on a wall, front of panel, or flush on a panel, the case includes a heavy inlaid sponge-rubber door gasket, flush roll-type door handle, and non-projecting door hinges. Removable mounting block, holding the external connections to the instrument, can be mounted either on bottom or back of case. Pen arms are pivoted on stainless steel journals, with shaft supported in rigid one-piece mounting. Link mem-



Maybe your Record System

is holding up the parade



Too many businesses are struggling under the handicap of a Model T record system simply because no one has had the time to do anything about it. As a result, shipments lag, inventory bottle necks, operating capital is tied up, and sales slow down to keep in step.

Your Diebold man can contribute a great deal toward speeding up your work-in-process schedule, however satisfactory, through practical control methods. With every type of record system to offer he is prepared to give you an unbiased recommendation following a careful analysis of your situation.

Even though you don't feel the need for major changes, why not send for the new Diebold booklet "Controlling, Handling and Housing Shop Orders," or phone the nearest Diebold Branch or dealer for interesting and valuable suggestions?

Diebold

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Canton 2, Ohio

Please send my free copy of "Controlling, Handling and Housing Shop Orders" that tells how to speed up my paper work.

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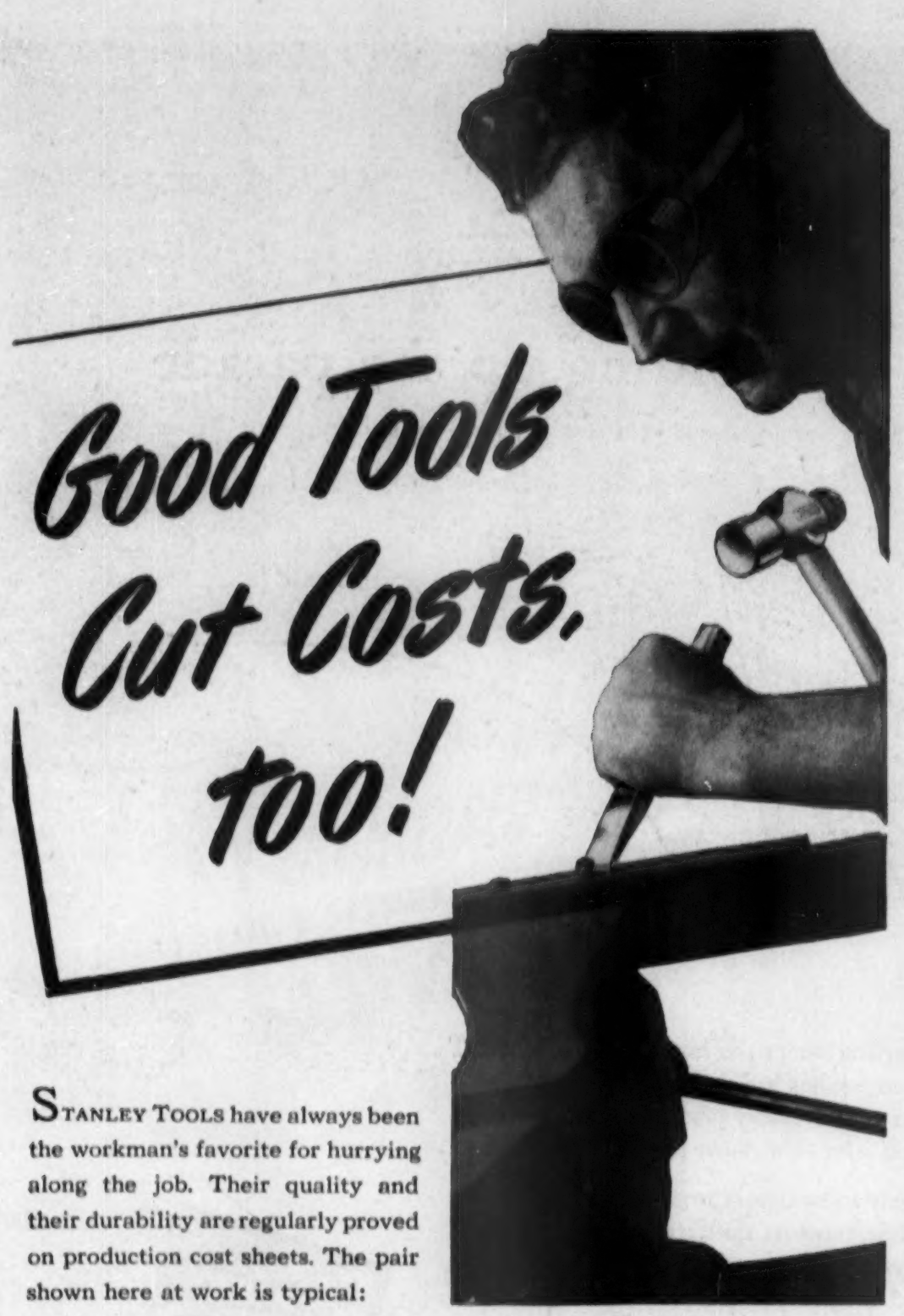
City and State .....

.....



Good Tools Cut Costs, too!

STANLEY TOOLS have always been the workman's favorite for hurrying along the job. Their quality and their durability are regularly proved on production cost sheets. The pair shown here at work is typical:

Stanley Ball Pein Hammer — No. 310 — 16 oz.–Octagon pattern–forged, polished head–high grade steel, superheat-treated – polished hickory handle securely wedged by "Evertite" process. Wide choice of sizes.

Stanley Cold Chisel — No. 990 – Quarter octagon pattern – chrome vanadium alloy steel, drop forged, oil hardened and tempered by a special process to produce a tough cutting edge. Sizes, to match the job.

How many hand tools in your plant are still in use yet badly worn? Replacement of these with new Stanley Tools will help cut costs in every department. Order from your distributor. STANLEY TOOLS, 151 Elm Street, New Britain, Connecticut.

THE TOOL BOX OF THE WORLD

STANLEY

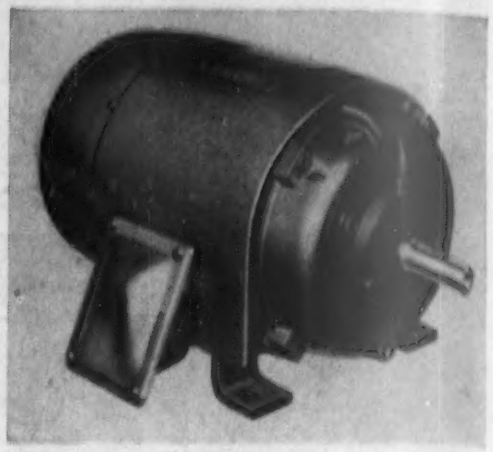
Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

bers are removable without tools. The instruments are furnished in 8- and 12-in. sizes, in a variety of ranges. The Bristol Co., Waterbury 91, Conn.

A.C. MOTORS

"Precisioneered Line" of squirrel-cage a.c. motors has been developed for application to machine tool drives of all types. Available in protected (open



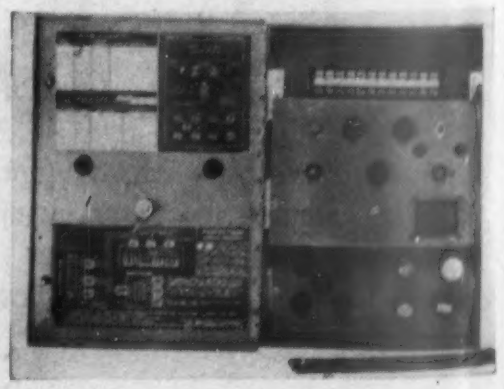
type) frames as well as in totally enclosed designs, the line features all-steel frames, welded cores, aluminum pressure-cast rotors, precision bearing mount, and 13-step insulation treatment. Ranging in capacity from 1 to 200 horsepower, motors are made in foot-mounted, end-mounted, and flange-mounted types. The Reliance Electric & Eng. Co., Cleveland.

SAFETY AND RELIEF VALVE

Corrosive vapors or gases can be handled by safety and relief valves using Hastelloy-C for the inserted nozzle and valve disk, and, in certain models, for the complete valve body. The hard, corrosion-resistant, nickel-iron alloy contains molybdenum, silicon, and copper. All working parts of the valve are isolated behind a vapor-proof Farri Seal curtain, which is a flexible material of either rubber, neoprene, or corrosion-resistant metal. It is attached to the disk at one end and the flanged disk guide at the other. High disk lift permits full-capacity discharge. Available with flange connections in sizes from ½ to 2 inches, with screwed connections in sizes from ½ to 1 inch. Farris Eng. Corp., 531 Commercial Ave., Palisades Park, N. J.

OVERLOAD PROTECTOR

Damage to tools, dies, and machinery is said to be prevented by the Protectron, an electronic instrument for use with an electric motor-driven machine to "trip" at any pre-set mechanical load increase above normal. When the instrument trips, a red warning light shows, and a relay is energized to stop the motor, stop the machine by oper-



IN THE "BUSINESS END" OF THIS TURBO-JET . . .

nothing equals Stainless Steel!

Photo Courtesy Ryan Aeronautical Company

FABRICATED of U·S·S Stainless Steel, this jet tail-pipe of one of the Navy's newest fighters blasts a 1000 m.p.h. tailwind at a temperature of 1000°F. This hurricane of searing exhaust gas, which would destroy the airframe structure if unleashed, is channeled safely within walls of heat-resisting Stainless Steel. The combustion chambers, too, which rim the engine are made of Stainless to resist high temperatures and the corrosive attack of the combustion products.

Because it so ideally combines light weight, corrosion resistance, and strength under heat, Stainless Steel is the best material for countless other applications where these qualities are important . . . in refinery bubble trays and towers, in chemical equipment of many kinds, even in your wife's pressure cooker or favorite sauce pan.

But in using Stainless Steel it is well to remember that "Stainless" covers a wide field of superior steels that vary considerably in their properties. They differ in their resistance to corrosion. Their strength under high temperatures is not the same. They have different hot and cold working properties. They are not alike in their machining characteristics. They also vary considerably in cost.

That is why it is advisable to talk your problems over with our metallurgists. They know what Stainless Steel has done and what it will do in almost any kind of service. Their cooperation can be extremely helpful in the proper selection of the right Stainless for your needs—and in its efficient fabrication as well.

It takes SCRAP to make STEEL . . .
PLEASE TURN YOURS IN!

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

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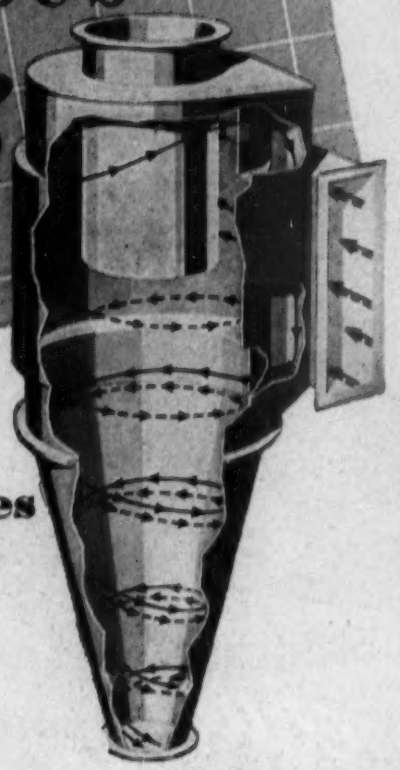
CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh & Chicago · COLUMBIA STEEL COMPANY, San Francisco
NATIONAL TUBE COMPANY, Pittsburgh · TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham
UNITED STATES STEEL SUPPLY COMPANY (Warehouse Distributors), Chicago : UNITED STATES STEEL EXPORT COMPANY, New York

Known by the Promises it *Keeps*



★ **A Practical High in Fractional Efficiencies**

★ **Most Work per Dollar in Overall Costs**

★ **Next to No Maintenance**

★ **Next to No "Wear Out"**

Ten years and more of Buell van Tongeren Cyclone performance in dust control and recovery, in a wide spread of American industries, lays indisputable evidence on the line.

The principle of the cyclone is essentially simple. But it remained for the van Tongeren patent to add real operating efficiencies in handling dust particles of micron-size fineness. Here for all to see is the unique Buell cyclone . . . with practical operating efficiencies a matter of Industry record.

To every engineer and businessman currently devoting time and thought to a particular problem of dust control or recovery, we offer the Buell fund of practical information. A most useful engineering perspective will be opened up by a study of our new book "Engineered Efficiency in Dust Recovery". A copy is yours for the asking. Write: Buell Engineering Co., 12 Cedar Street, New York 5, N.Y.

buell

Engineered Efficiency in **DUST RECOVERY**

ating clutch and/or brake, increase or decrease voltage on motor, or to sound a warning signal. The unit combats jamming in automatic feed machinery, and can be used to stop pumps as well as to signal when shears or drills are dull. Available for 220/440-volt, 60-cycle motors in two models—for operating current of 1 to 5 amperes, and for 5 to 10 amperes. The Brinnell Co., Granby, Conn.

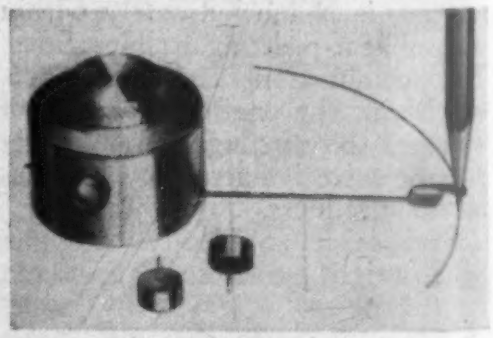
PIPING TEST UNION

Made of a carbon steel cut from solid bar stock, a 750-lb. test union is suitable for low- or high-pressure piping.

Claimed to withstand 1500-lb. pressure without distortion or leakage. Each piece is precision machined, and the locknut is cut from solid bar stock and machined to correct dimensions. Secure brass seat is designed to resist wear and corrosion. Available in sizes up to and including 1 inch, in black or zinc. Defiance Automatic Screw Co., Ft. Wayne Rd., Dept. 5, Defiance, Ohio.

SMALL COMPASS

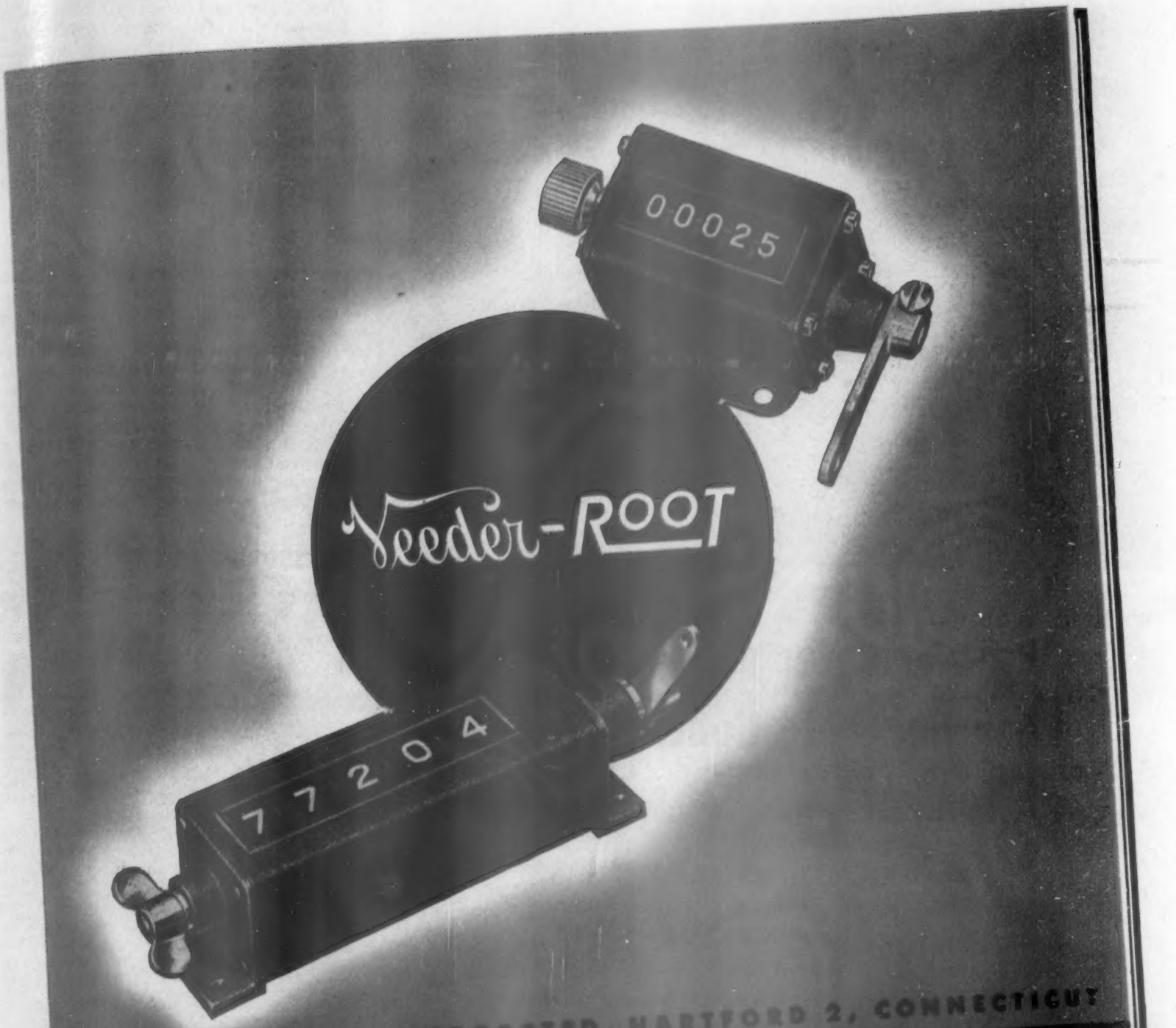
Circles from 2 inches to 12 feet in diameter can be made with the small Flex-A-Beam compass. It may be used to



draw ellipses, spirals, and arches. The compass consists of a stretch-proof linen line on an aluminum encased reel. Three push-pins serve as center points for the compass. A releasing button permits the line to be drawn out to whatever radius is desired. Stewart-Jackson Instrument Co., Inc., 815 Yale Ave., Los Angeles 12.

AIR HAMMER

Quick, simple adjustments from 90-deg. position to any desired increment of angle through a full 180-deg. arc are claimed for air hammer. This feature,



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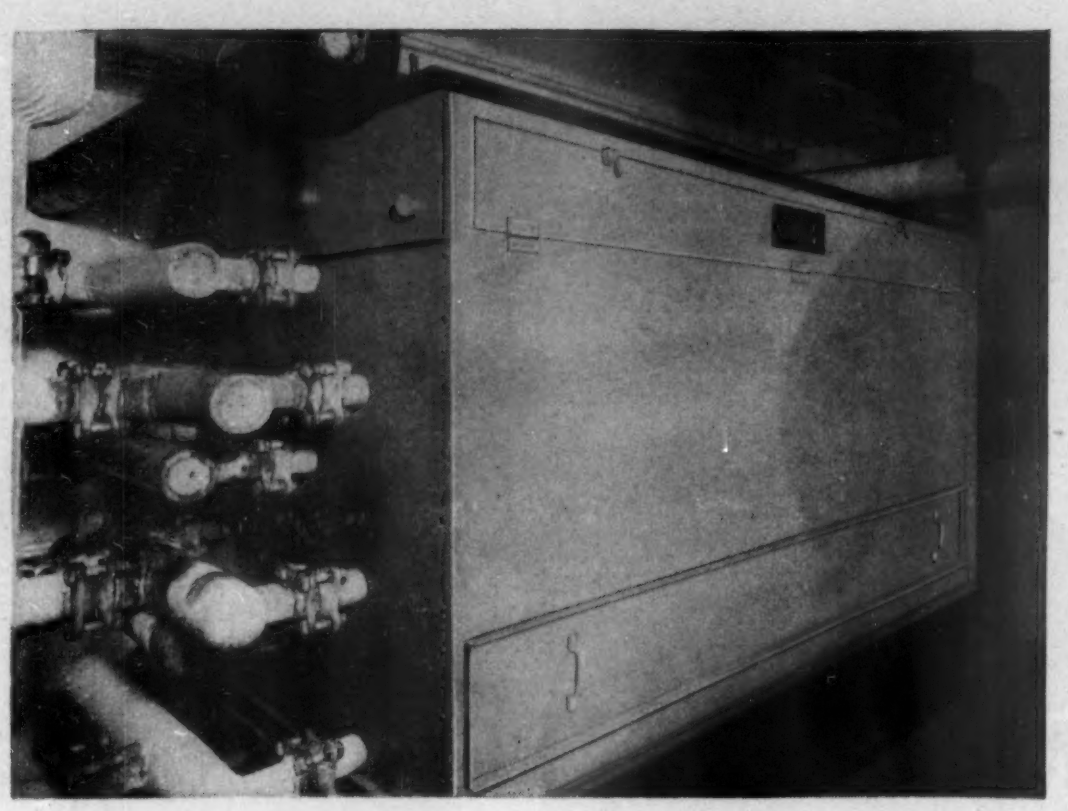
VEEDER-ROOT INC., HARTFORD 2, CONN.



Chilling Water or Liquids With Accurate Control of Temperature

Regardless of either variation in the cooling load or intermittent operation, the new Niagara Liquid Cooler holds the delivered temperature accurately at the required point. It will deliver fresh water at 33°F. constantly without danger of freezing damage and produces lower temperatures accurately in non-freezing chemical liquids and solution.

Capacity range in available models is from 24 to 465 gallons per minute. High capacity and fast chilling are provided in extremely compact space. The cooler is reliable and easy to maintain; all parts are accessible for cleaning; insulation is easily applied; operation is economical of power and refrigeration.

Write for Bulletin No. 100—FM

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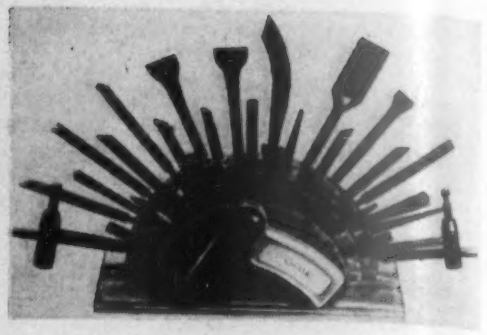
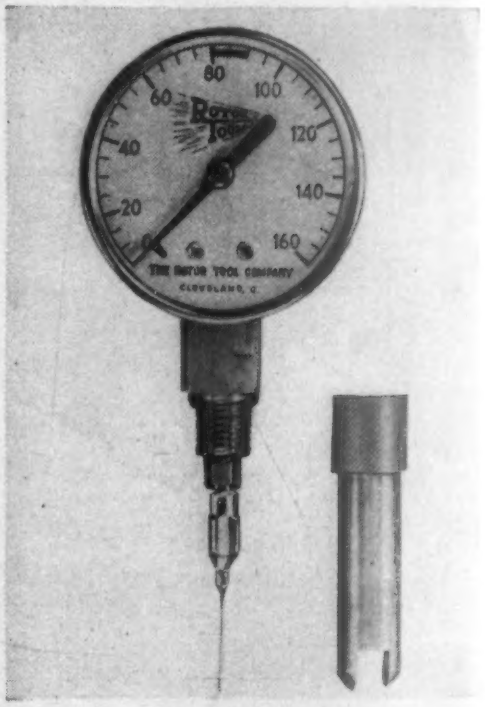


and the adjustable light or heavy hammer action (effected by the built-in needle valve), permit use in close quarters and corners. Weight is less than 3½ pounds, and it consumes 5 cubic feet of air per minute at 90-lb. pressure. The rugged one-piece cylinder assures trouble-free performance, according to the manufacturer, even when operating with more than 150-lb. pressure. Available with the air hammer are a variety of interchangeable tools made from shock-resisting steel tempered to the proper hardness. Wen-Lyn Products, Burbank, Calif.

PRESSURE GAGE

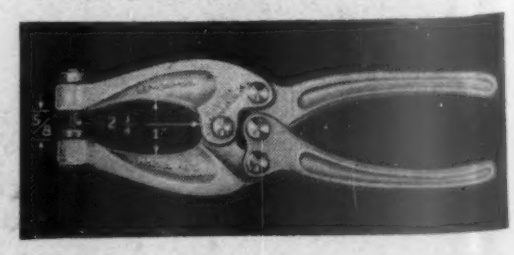
Needle-type pressure gauge, Model MSK-55, is inserted in the air hose to indicate pressure at the air tool while in



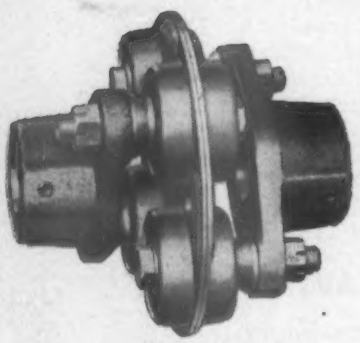
operation. A hollow needle (hypodermic type) with a sharp tapered point is secured in an adapter which fits on a taper on base of gage. When not in use, the needle is protected by a sleeve. The Rotor Tool Co., Cleveland.

TOGGLE CLAMP

Model 464 plier clamp is made for operations requiring quick, positive pressure on relatively light gage materials up to ⅜ inch thick. Toggle lock action holds parts in position for drilling, riveting, welding, and gluing. Suitable for templet locating, the clamp provides firm hand grip for opening and closing. Nose



MORFLEX COUPLINGS have them ALL!

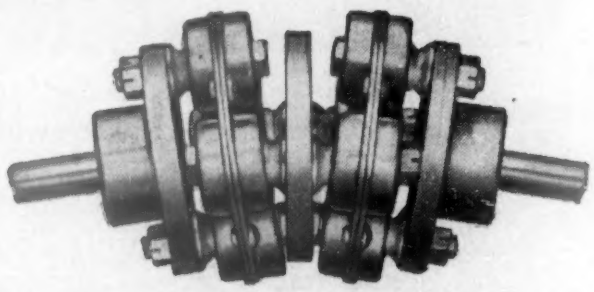


MORFLEX

The "floating center unit", composed of specially-designed, preloaded Neoprene biscuits, gives Morflex its flexibility. Morflex is available in nine sizes, from 20 to 725 lbs-ft of torque capacity.

MORFLEX JUNIOR

Same high-quality workmanship and precision engineering as its "bigger brother." Morflex Junior couplings are used in smaller power drives and accessories. Available in two sizes, 3 and 9 lbs-ft of torque capacity.



DOUBLE MORFLEX

Two Morflex center members joined to an adapter plate. Acting as a universal drive, it compensates for extreme angular or parallel misalignment of shafts. Double Morflex couplings available in 10 sizes, 13 to 725 lbs-ft of torque capacity.

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Friden Automatic Calculator Parts

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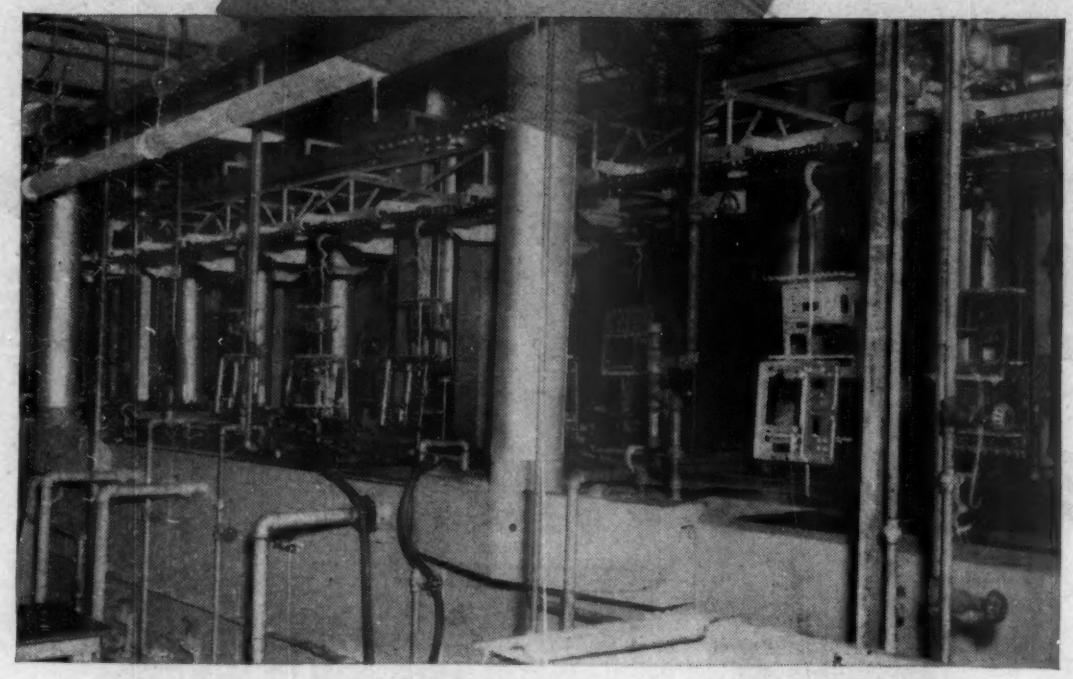
FULLY AUTOMATIC PLATING MACHINE



The plating machine installed here is the one hundredth of its kind constructed and sold within 18 months by Udylite

The Friden Calculating Machine Co. of San Leandro, California is now cadmium plating the parts for its product in this Udylite Fully Automatic Plating Machine.

Production rates are 180 large parts, bases, etc., or 6400 smaller parts per hour. The machine completes one cycle every 18 minutes during which the parts are not touched from the time they are racked until they are unloaded and ready for assembly or storage.

This machine operated by one plater is fully adjustable for any plating cycle desired. It turns out the production which previously required five hand platers. It assures uniformly plated parts and it occupies less floor space than would be required by any other method.

Udylite — *THE UDYLITE CORPORATION*

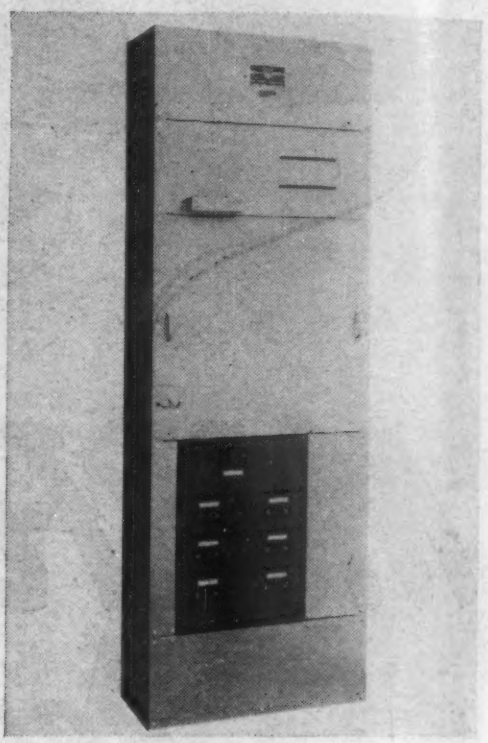
DETROIT 11, MICHIGAN

REPRESENTED IN PRINCIPAL CITIES

is narrow for use in restricted spaces. The tool is forged, and may be revamped for special application by welding and grinding. Replaceable hardened steel bushings minimize wear. Detroit Stamping Co., Dept. K, 330 Midland Ave., Detroit 3.

STANDARDIZED SWITCHBOARD

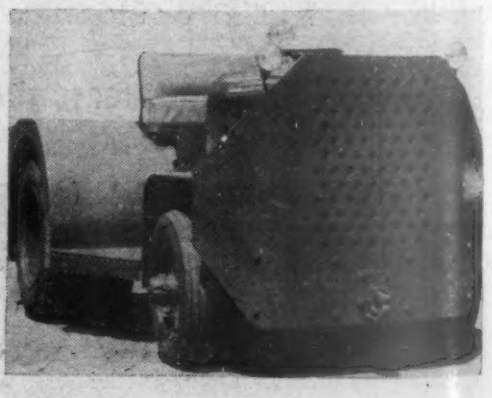
All-in-one switchboard for electrical distribution provides main service protection and sub-feeder units in one compact assembly, with provision for



load meter, current transformers, and test facilities. It is totally enclosed in a 30x90x14-in. standard die-formed, gusset welded, 12-gage stock cabinet. Standardized models may be either fusible type Vacu-Break switch unit, or industrial type air circuit breaker, or combination, in 15- to 400-amp. sizes, quantity and amperage of units determined by installation requirements. Mullenbach Electrical Mfg. Co., 2300 East 27th St., Los Angeles 11.

HEAVY-DUTY TRACTORS

Extra-heavy-duty Shop Mule tractors are 120 inches in length (less coupler). Models H90 and H75 have single pneumatic drive tires, and Model H120 has dual pneumatic drive tires. Power is furnished by an International GRD 233 6-cylinder engine, with 68.5 brake horsepower at 2400 r.p.m. Model H75 has a drawbar effort of 7500 pounds; Model H90, 9000 pounds; and Model H120, 12000 pounds; providing towing capacity on dry level concrete ranging from 150 to 240 tons. The pneumatic drive tires and heavy cast rear fenders assure traction in all weather, and the addition of



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"MORE POWER TO YOU" IN PRODUCTION — Assembly speeds skyrocket with fumble-proof, slip-proof, burr-proof and damage-proof American Phillips Screws — they're automatically straight to drive. Makers of motors, boats, planes, appliances, furniture, radios and other products who have set their sights for volume production and lower costs earn time-savings UP TO 50%.

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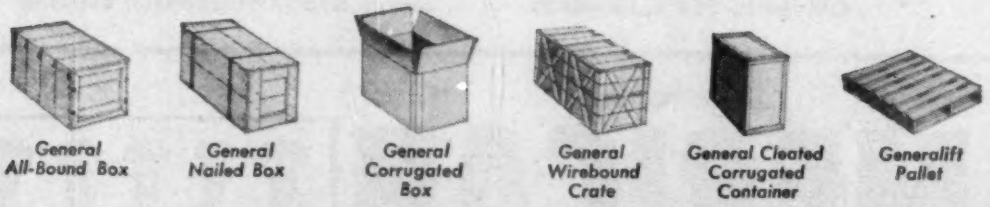

General All-Bound Box | General Nailed Box | General Corrugated Box | General Wirebound Crate | General Cleated Corrugated Container | Generalift Pallet

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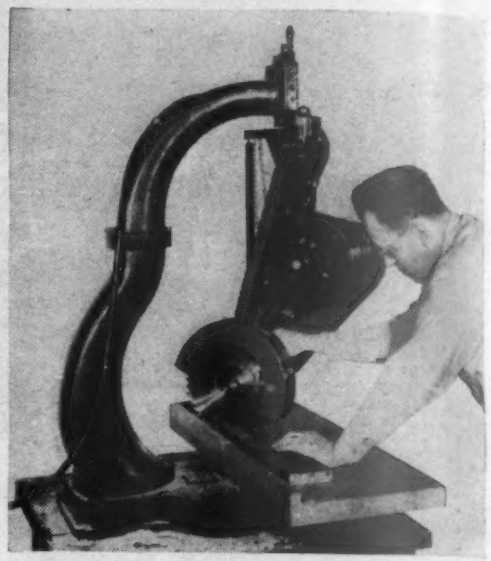
Continental Box Company, Inc.: Houston, Dallas.

wheel sanders permits operation in sleet and snow. W. F. Hebard & Co., 336 West 37th St., Chicago 9.

SWING SAW

Suitable for construction jobs and other uses, No. 1200 swing saw can be carried from job to job. It is adaptable to cutting wood, metal tubing, angle iron, and plastics. Swivel adjustment on arm permits



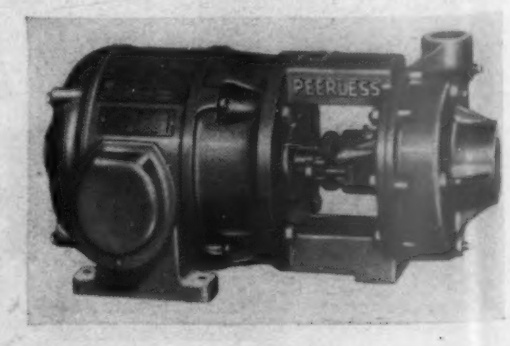
miter cuts up to 90 degrees. The saw is mounted on an extra-heavy cast iron base, and is rigidly supported by a cast column. Total over-all weight is 330 pounds net. Standard ¾- to 2-hp. motor may be mounted on the arm. A 12-in combination rip and crosscut saw blade with 1-in. hole is furnished. Any standard saw blade or abrasive disk may be used. Fenlind Eng. Co., 252 Mill St., Rockford, Ill.

PAINT REMOVER

Paint is said to be removed from wood and metal surfaces without raising the grain or otherwise harming the surface, by means of a compound called Paint-Zip. It is designed to penetrate multiple paint coatings, breaking the bond that holds the finish to the work. Stripping action is visible by wrinkling, blistering, and lifting of the paint film. Entire sheets of loosened paint can be peeled from the surface. Non-flammable, the paint remover will not support combustion, but burns only as long as a flame is applied. maker states, and flying sparks will not ignite it or the old material being removed. Turco Products, Inc., 6135 South Central Ave., Los Angeles 1.

CENTRIFUGAL PUMP

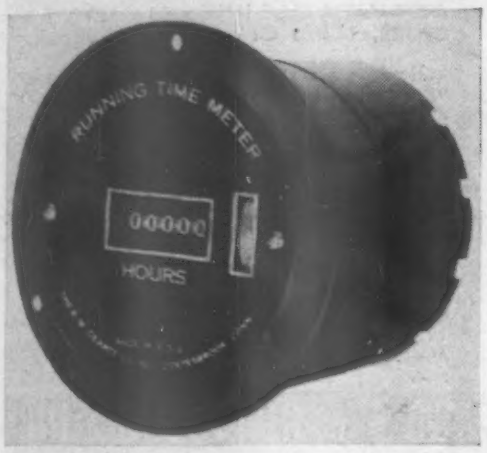
Single-stage, end-suction, vertically split-case centrifugal pump, designated Fluidyne, has power drives from fractional to 20 horsepower. Handles water and other liquids in capacities up to



1000 g.p.m. against heads up to 270 feet. Type PE is an integrally coupled, compact electric unit in which pump and driving motor are anchored on the motor footing. Model PB is a belt-driven unit with the iron frame and bearing mounts supporting the various pump sizes integrally cast. It is either keyed to a V- or flat-belt pulley, or direct-connected to a standard horizontal electric motor by a pin-type flexible coupling. Operates in any position. Peerless Pump Div., Food Machinery Corp., 301 West Ave. 26, Los Angeles 31.

RUNNING TIME METER

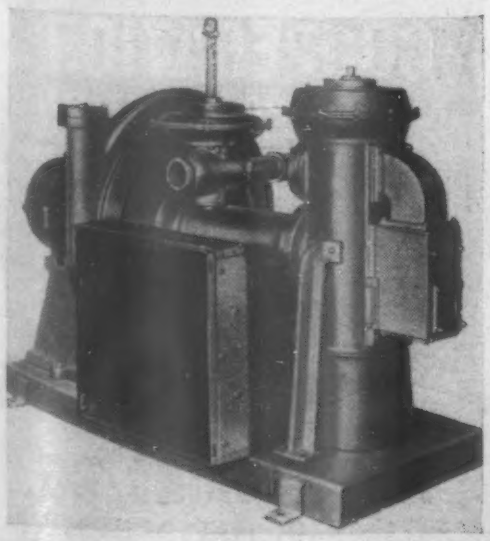
Time totalizer, or running time meter, features a counter that can be reset to zero. Used on a.c. circuits, meter automatically registers total operating or idle time of any circuit, machine, or system to which it is connected. Pre-



cision-built 5-digit revolution-type metal counter indicates in tenths up to 10,000 hours, then repeats. Type E5, furnished in die casting, is suitable for bench use, and Type E6 is enclosed in metal housing arranged for conduit connection. Type E7, 3¾ inches in diameter, for flush panel mounting, is equipped with knob reset. The slow-speed, self-starting synchronous motor starts and operates on rated voltage plus 10 per cent. The meters can be furnished for 60- or 50-cycle frequency, 110 or 220 volts. The R. W. Cramer Co., Inc., Centerbrook, Conn.

GAS-AIR MIXER

Redesigned McKee cone-type diluter for automatic gas-air premix systems features an adjustable compensator mechanism which permits a richer mixture. For large capacities, the filters are of replaceable glass-fiber-felt airmat; for low capacities, of metal fibers coated with oil (viscosine) mounted in a cir-



Give Maintenance Costs the "Brush-off!"

Dusting unnecessary maintenance costs out of your plant picture is as easily done as said—and here's why: It's the time and labor involved—not the cleaning materials—which constitute by far the greater part of your sanitation costs.

And that's where, by utilizing a program of *planned* sanitation employing West products, you can just about cut maintenance man-hours and resulting costs to the bone. Longer-lasting . . . easier to apply . . . designed to do the best possible job in the least possible time, West maintenance products are economical and beneficial in still other ways.

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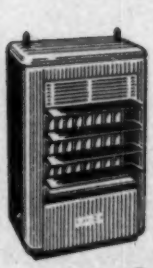
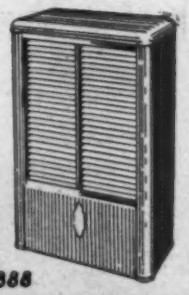
Reznor automatic gas units heat any size area—do the heating job right—in offices, restaurants, stores, factories, warehouses, and commercial buildings. The big, quiet fan and high-yield heat exchanger put heat where you want it, at less cost . . . eliminate expensive central heating plants. Send today for complete data on Reznor Suspended and Floor-Type units.

REZNOR
Gas fired unit heaters

SUSPENDED OR FLOOR MODEL



A SIZE FOR EVERY NEED



REZNOR CO.
MERCER, PENNA.

Gas Heaters Since 1888

NO BOILERS . NO STEAM LINES
NO FUEL STORAGE . NO FIRE TENDING

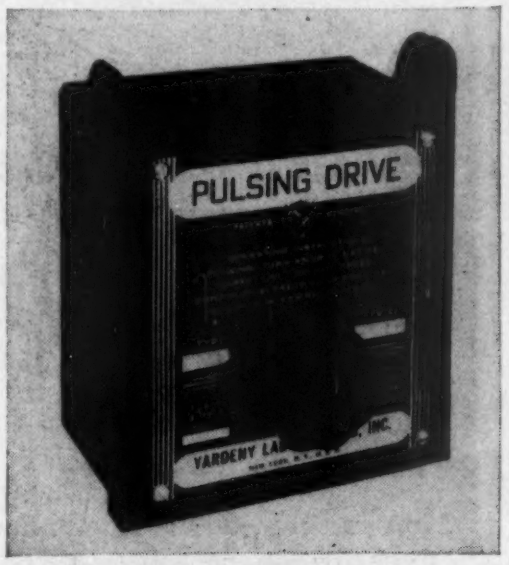
cular metal housing from 8 to 16 inches in diameter. The mixer is an assembly of several units working together to mix gas with air or with gas, in proper proportion, delivered at the pressure required by the specific application. Eclipse Fuel Eng. Co., 733 South Main St., Rockford, Ill.

SILVER SOLDER

High capillary action and increased tensile strength, as well as good appearance after brazing, are claimed for a solder having 20 per cent silver content. The alloy has a melting temperature of 1430 deg. F., and 145,000-p.s.i. shear strength, maker says. It is suitable for brazing carbide tips to steel shanks, and for the fabrication of light steel parts. Can be used on steel, brass, copper, stainless steel, and inconel. Available in wire, strip, or rings. The alloy, known as No. 103 flux. All-State Welding Alloys Co., Inc., 96 West Post Rd., White Plains, N.Y.

JOGGING CONTROL

Electric motors can be controlled by Pulsing Drive when accurate positioning is required. It responds to the operation of a single knob. The time period—basic pulse duration—is adjustable in a range to suit local conditions. Provision is

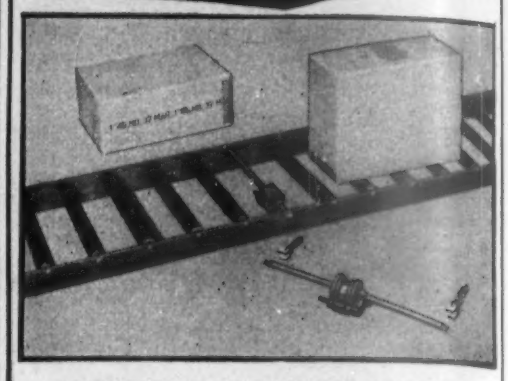


made for continuous contact, when continuous rotation of the motor at full speed in either direction is desired, or for moving in small increments. When properly connected to the jogging control, an electric motor of any type will follow the motion of the control knob. Supplied in standard steel enclosure, Type B is suitable for inclusion in all existing motor-driven equipment. Applications include precision inching of machine tools, conveyors, and presses. Yardeny Laboratories, Inc., 105 Chambers St., New York 7.

THERMOSTATIC STEAM TRAPS

Cast steel thermostatic steam traps are claimed to withstand the shock of external explosions, to handle corrosive condensate, and to operate with pressures to 300 p.s.i. or with superheat. One model of the series has a bronze thermostatic element for maximum operating pressures to 225 p.s.i. saturated steam. The thermostatic element is a patented helical bellows which permits a large orifice, and the greater air venting capacity is said to provide rapid heating from a cold start. When installed

CONVEYOR-CODER
Marks Containers
WHILE THEY ROLL



AUTOMATICALLY IMPRINTS CARTONS, CASES, BOXES on ROLLER CONVEYOR

Replace a standard roller on your conveyor with CONVEYOR-CODER and get automatic marking of shipping containers. CONVEYOR-CODER imprints clean, sharp code-dates, control numbers, content information, etc., on packages as they roll along conveyor. Simple to install—does not interrupt container movement. Interchangeable rubber type feature permits quick changes of imprint legends. CONVEYOR-CODER automatically re-inks type with permanent, quick-drying inks available in different colors.

Write today for descriptive literature and state exact nature of your marking needs.

ADOLPH GOTTSCHO, INC.
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MACHINES TO MARK WHATEVER YOU MAKE

COOPERATION
KEY TO PRODUCTION

Present tangible recognition to employees through Robbins real karat gold awards. Nothing replaces gold in value; nothing replaces employee recognition for increased production, improved labor-management relations, and greater worker interest. Sketches and designs submitted without obligation.

THE ROBBINS CO.
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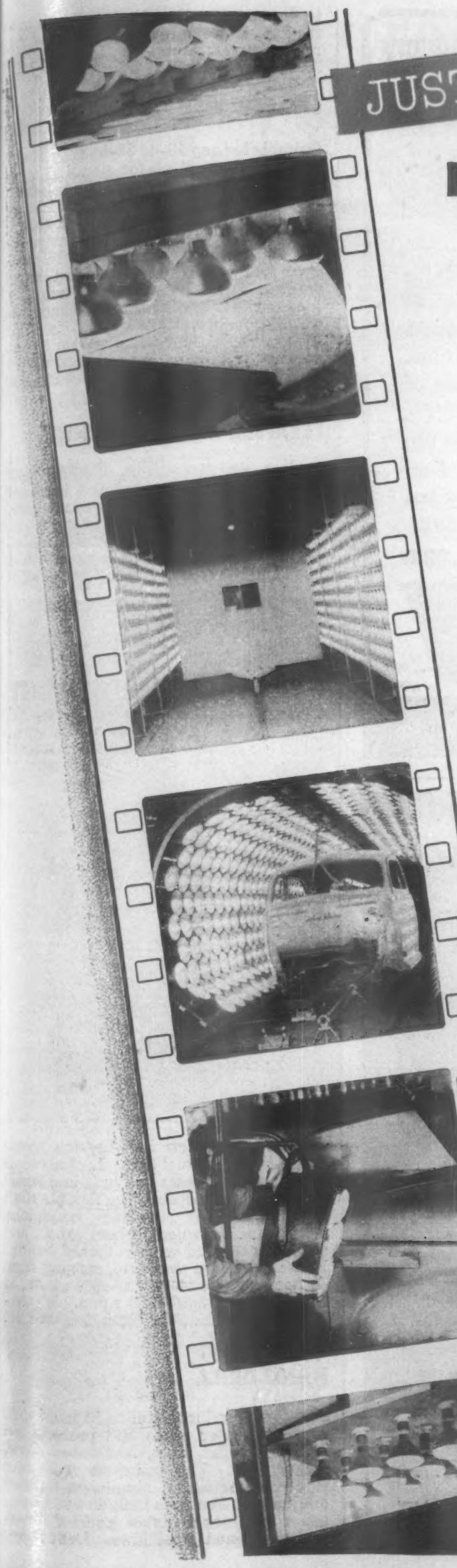


JUST RELEASED:

NEW G-E SOUND SLIDE FILM ON INFRARED

HERE'S a 30-minute picture story you can't afford to miss! This brand new, full-color, sound slide film was prepared for industrial production people by General Electric. It gives you quickly and interestingly all the facts you need to size up the value of infrared radiant energy as a production tool in *your* plant. And you'll see how baking, preheating, dehydrating, curing and drying can be done better with infrared lamp ovens.

Showing in your Area

For full information on the showing of this important sound slide film in your area, call your nearby General Electric Lamp office—or your electric service company. Don't miss it!

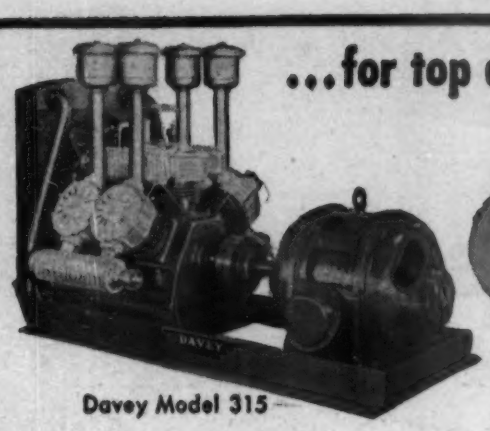
G-E Infrared Lamps offer Important Advantages

Here are six ways infrared processing can help you: 1) Low first cost. 2) Quick, easy installation—adaptable to any production scheme. 3) Quick heat at low operating cost. 4) Faster production. 5) Low maintenance cost. 6) Worker safety and comfort.

You put these advantages to best use by consulting a recognized oven manufacturer. And by making *sure* you get G-E infrared lamps. General Electric offers a complete line of infrared Industrial Lamps, from 250 to 1000 watts. Most popular types in 250 and 375-watt sizes, are: (1) R-40 with reflector hermetically sealed in bulb, giving smooth, even distribution of radiant energy. (2) G-30 with clear bulb, suitable for open reflector installations. Both types have mechanical bases. *General Electric Company, Nela Park, Cleveland 12, Ohio.*

G-E LAMPS

GENERAL ELECTRIC



Davey Model 315

...for top air output *plus* economy

SPECIFY DAVEY DEPARTMENTAL *Compressors*

DAVEY DEPARTMENTAL COMPRESSORS GIVE YOU THESE ADVANTAGES

- Power savings
- Lower air losses
- Maximum air operating efficiency
- Make plant expansions easy and economical
- Eliminate shutdowns due to compressor failures
- Air cooling eliminates water bills
- Ease of installation
- Reduced maintenance and replacement expense

IN LINE with today's trend toward employment of small departmental compressors instead of one large centralized machine, Davey offers a complete line of industrial units.

These are available in 60, 105, 160, 210 and 315 c.f.m. capacities. And every Davey has GUARANTEED LIFETIME VALVES.

DAVEY COMPRESSOR CO. • KENT, OHIO

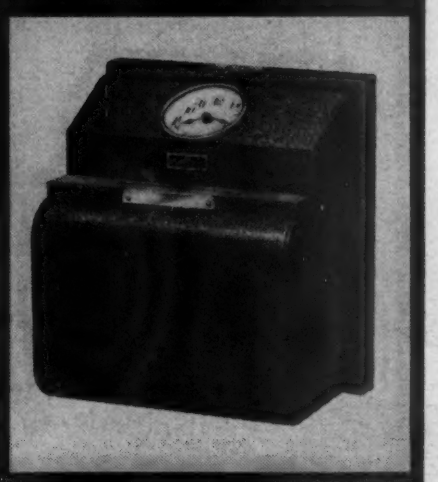
Write for Bulletin E-219

DAVEY

P & P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

SIMPLEX PROVIDES FOOLPROOF RECORDS FOR FIGURING WORK AND PAYROLL TIME



With "Simplex" on the job, there's never any cause for work stoppages trying to straighten out time-card records. Every employee on checking "in" or "out" writes his (or her) own "ticket" and indirectly his (or her) own payroll check. The record he actually writes is so correct and so free from possible misunderstanding that the payroll department can quickly and accurately handle each and every pay check with utmost dispatch. There are no "ifs," "ands" or "buts" about it. There is the record and there is the exact amount in the pay envelope.
All this is accomplished with the new Simplex Trigger-Touch Time Recorder which employs the exclusive Simplex Notched Time Card, and avoids any possibility of incorrect recording.

INVESTIGATE TODAY

The coupon is for your convenience in asking for further details.

SIMPLEX TIME RECORDER CO., GARDNER, MASS.

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FM-9

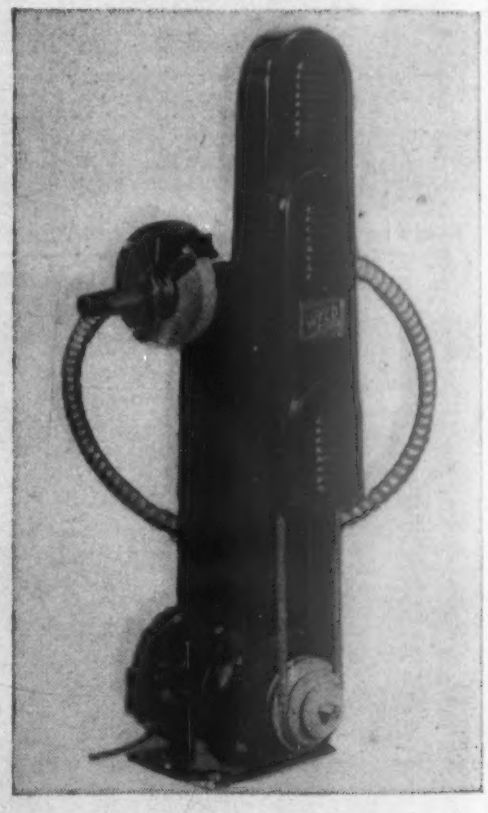
to discharge to the atmosphere, no protection is required against freezing, maker states. Sarco Co., Inc., 475 Fifth Ave., New York 17.

SHAPER VISE

Suitable for any 16- to 32-in. shaper, vise holds work in place for standard operations. The heavy-duty, single-screw, parallel-jaw vise has base which, by releasing two bolts, swivels to any angle, and locks in position. The screw passes through both movable and solid back jaw, followed by end nut and keyed washer. Steel-inserted jaws are 11½ inches wide, 2½ inches deep, and open to 13½ inches. Base of vise is 12x14 inches, T-slot bolt holes are on 9½-in. centers. Tightening wrench is furnished. Cincinnati Machinery Co., Inc., 224 East 2nd St., Cincinnati 2.

FLEXIBLE SHAFT MACHINE

Known as Streamflex, flexible shaft machine is said to combine increased convenience and safety in a multi-speed machine. It is of all-welded steel construction. All pulleys and belts are enclosed in the dust-free cabinet, which has a sliding, removable cover. The



cabinet swivels on ball-bearing motor base with 16-in. tool tray. Locking shaft holder secures shaft and grinding wheel for stationary grinder. The flexible shaft has non-metallic innerliner, handpiece, 6-in. grinding wheel, wheel arbor, and steel wheelguard with outboard handle. Five models are available, ranging from ½ horsepower, 1400-2400-4500 r.p.m., to 1 horsepower, 3600-6000 r.p.m. Wyzenbeek & Staff, Inc., 838 West Hubbard St., Chicago 22.

HAND DRILL

Fully enclosed mechanism in hand drill prevents finger nicks and protects the drill from dirt, dust, and wood chips, maker says. The casing is of 2-piece cast construction of aluminum-finished alloy metal. Features include two pinion gears and nickel-plated knurled chuck with hardened steel jaws. Drill needs

FOR TROUBLE-FREE WIRE PERFORMANCE

125 Permanently Insulated ROCKBESTOS Wires, Cables and Cords

1 2 3 4 5
ROCKBESTOS A. V. C.
asbestos and varnished cambric insulated;
For Motor Leads, Control and Power Circuits, Switchboards, etc.
1 4 5
ROCKBESTOS ALL-ASBESTOS
impregnated asbestos and asbestos braid;
For Rheostats, Grid Connections, Power Leads, Furnaces, Apparatus, etc.
4 5
ROCKBESTOS PLAIN ASBESTOS
felted asbestos insulation; various impregnants;
For Instrument Leads, Ranges, Fixtures, Appliances, etc.

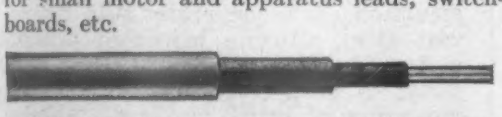
From the three basic designs illustrated Rockbestos has developed a complete line of 125 failure resisting wires, cables and cords, a few of which are described. All have the same performance guaranteeing characteristics detailed below. Write for information or samples.

Rockbestos Permanent Insulation Insures Long-Lived Service

1. A tough impregnated asbestos braid, resistant to heat, flame, moisture, oil, grease, alkalies and corrosive fumes.
2. Felted asbestos insulation impregnated with heat, flame and moisture resisting compounds will not dry out with age, burn, or bake brittle under high temperatures.
3. Lubricated varnished cambric for high dielectric strength and added moisture resistance — protected from heat, flame and oxidation by felted asbestos walls.
4. Impregnated asbestos insulation that withstands heat of overloads and aging and won't become brittle, crack, rot or burn.
5. Conductors are perfectly centered in helically applied non-flowing insulation and will always remain so.

ROCKBESTOS 300 VOLT HEAT RESISTING FIXTURE WIRE
(Underwriters' Type AF)
Sizes No. 10 to 18 AWG stranded plain copper conductor insulated with black or white impregnated felted asbestos—with or without braid.

Rockbestos asbestos insulated fixture wires, approved by the Underwriters' Laboratories for lighting fixture wiring, will not bake out under the high socket temperatures developed in modern high-wattage fixtures. Also used for small motor and apparatus leads, switchboards, etc.

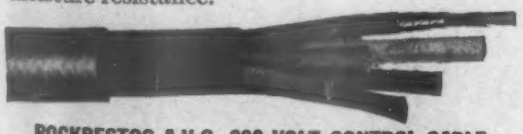


ROCKBESTOS A.V.C. 600 VOLT SWITCHBOARD WIRE
(National Electrical Code, Type AVB)
Sizes No. 18 to No. 4/0 AWG with varnished cambric and impregnated asbestos insulation and gray, black, white or colored flameproof braid.

Combine fire insurance and fine appearance in your switchboards with flame and heat resistant Rockbestos A.V.C. Switchboard Wire. Takes right angle bends without cracking because asbestos wall acts as a cushion beneath braid. Rockbestos A.V.C. Hinge and Switchboard Bus cables have same characteristics.

ROCKBESTOS A.V.C. 600 VOLT POWER CABLE
(National Electrical Code, Type AVA)
Sizes No. 18 AWG to 2,000,000 CM insulated with laminated felted asbestos, varnished cambric, and asbestos braid. Other constructions for service voltages to 5000.

This cable is recommended for power leads of heat-exposed equipment and circuits that run near boilers, steam lines, furnaces, kilns and other hot spots. It withstands high ambient and conductor temperatures and has ample moisture resistance.



ROCKBESTOS A.V.C. 600 VOLT CONTROL CABLE
In one to 19 conductors with individuals insulated like Motor Lead Cable, cotton braid covered and cabled with an asbestos braid over all. Standard strandings AWG No. 12—19/#25 and No. 9–19/#22. Other strandings on order.

Designed for applications requiring a multi-conductor control cable capable of withstanding high temperatures, corrosive fumes, oil, grease and moisture. It also eliminates fire hazard as it will not burn. Used by equipment manufacturers, power companies, steel mills.

ROCKBESTOS A.V.C. 600 VOLT BOILER ROOM WIRE
(National Electrical Code, Type AVA)
Sizes No. 18 to 8 AWG insulated with varnished cambric, impregnated felted asbestos and asbestos braid. Sizes 6 to 4/0 have another wall of felted asbestos next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, corrosive fumes or fire hazard around furnaces, ovens, lehrs, soaking pits, boilers, etc., this permanently insulated wire is ideal. It won't bake brittle, crack, rot, flow or swell.

ROCKBESTOS THERMOSTAT CONTROL WIRE
Sizes No. 14, 16 and 18 AWG in two to five conductors with .0125", .025" or (for 115 volt service) .031" of impregnated felted asbestos insulation and steel armor.

A multi-conductor wire for fuel burner controls, safety pilots, intercommunications and signal systems. Heatproof, fireproof insulation and steel armor give trouble-proof circuits.

ROCKBESTOS A.V.C. 600 VOLT MOTOR LEAD CABLE
(National Electrical Code, Type AVA)
Size No. 18 AWG to 1,000,000 CM insulated with two walls of impregnated asbestos and a high-dielectric varnished cambric insert, with a heavy asbestos braid overall.

Use this apparatus cable for coil connections, motor and transformer leads exposed to overloads or high ambient temperatures. It makes a permanent installation as it is resistant to heat, flame, oil, grease and moisture.

ROCKBESTOS ASBESTOS INSULATED MAGNET WIRE
Round, square and rectangular asbestos insulated conductors finished to meet varying winding conditions and coil treatment requirements.

Protect motors against heat-induced breakdowns with Class B windings of heat resisting magnet wire. Rockbestos A.V.C. Motor Lead Cable completes the failure-proofing.

ROCKBESTOS 300 VOLT HEAT RESISTING DUPLEX FLEXIBLE CORD
(Underwriters' Type AFPD)
Sizes No. 10 to 18 AWG stranded plain copper conductors insulated with impregnated felted asbestos, polarized, twisted together and covered with a cotton braid.

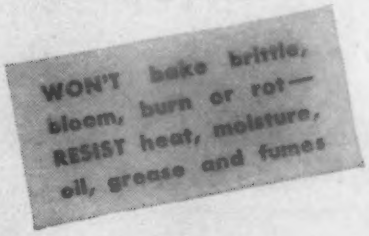
This heat-resisting cord is approved for use in lighting fixtures and is recommended for pendant types as it does not dry out or crack at the socket. Also on apparatus and appliances which develop heat in operation or are used in hot, dry places. Twisted pair, tripled or triplex constructions also available.

ROCKBESTOS A.V.C. 600 VOLT FLEXIBLE CORD
Sizes No. 10 to 18 AWG with two or three conductors insulated with impregnated felted asbestos, varnished cambric, felted asbestos, covered with heavy impregnated asbestos braid.

A heavy duty, high-dielectric, heat and moisture resistant flexible cord used in locomotive cab circuits, high wattage lighting units, floodlights and for leads on apparatus exposed to heat. Specify polarized conductors if desired. For high temperature applications where resistance to moisture is not required specify All-Asbestos insulated constructions.

ROCKBESTOS ALL-ASBESTOS 600 VOLT RHEOSTAT CABLE
(National Electrical Code, Type AIA)
Sizes No. 18 AWG to 1,000,000 CM insulated with a heavy wall of felted asbestos, covered with a rugged asbestos braid finished in black, white or colors.

Use this cable for wiring rheostats, switchboards, elevator and locomotive control panels and equipment exposed to heat, fumes or fire hazard — also for open power circuits in hot, dry locations. For flexible conductor specify Rockbestos All-Asbestos Flexible Apparatus Cable — for solid conductor, Rockbestos All-Asbestos Rheostat Wire.



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600 NICOLL STREET, NEW HAVEN 4, CONN.

ROCKBESTOS

The Wire with Permanent Insulation

It Can't Rust Now!

S.R.P.

("Sure Rust Prevention")

PUTS A RUST PREVENTIVE COATING ON IRON, STEEL AND GALVANIZED IRON SURFACES

Here's "Sure Rust Prevention" for both new and old metal! S.R.P. really digs into the metal surface, forming an impenetrable protective coating against corrosive salts, moisture, acid fumes and vapors, and weather exposure.

S.R.P. is easy to apply – needs no expensive preparation – goes on like paint – and you don't have to remove existing rust. S.R.P. penetrates through and combines with rust already formed, bonds firmly with clean metal, and forms an impermeable coating against air as well as moisture. It provides an exceptionally elastic film, free of pinholes, which expands and contracts with the metal to which it is applied.

Protect piping, fences, structural members and sheet metal surfaces with S.R.P. 75 Primer; then finish with either S.R.P. 87 (Red or Black) or SONOLASTIC Aluminum Paint (Ready-Mixed).

For Free Folder on "Sure Rust Prevention" write Dept. F-9.

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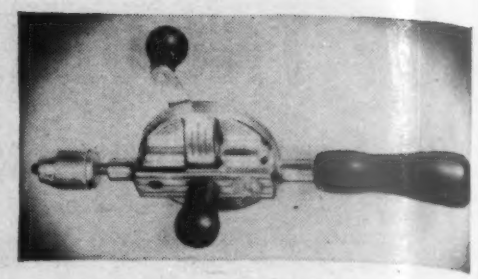
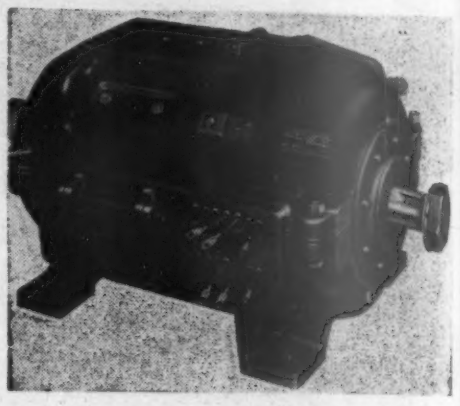


no lubrication. Bit capacity is 0 to ¼ inch. Oxwall Tool Co., Ltd., 928 Broadway, New York.

MILL MOTORS

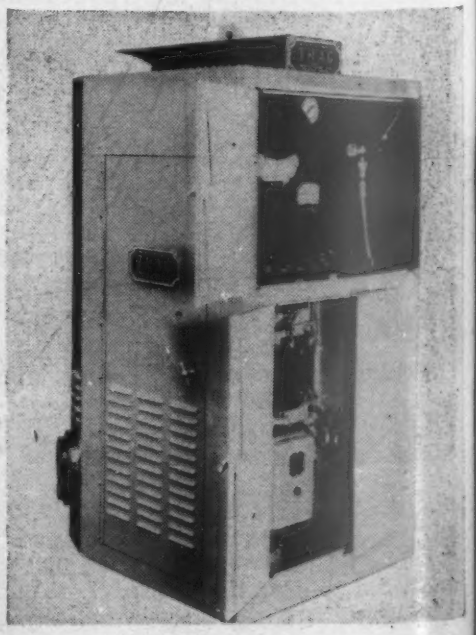
Line of mill motors, reduced one frame size, is said to have a larger and more efficient armature that fits in the limiting dimensions of the motor frame, new roller bearings and bearing housing, and redesigned field coils. The heavy-duty Type MC mill motor is available in

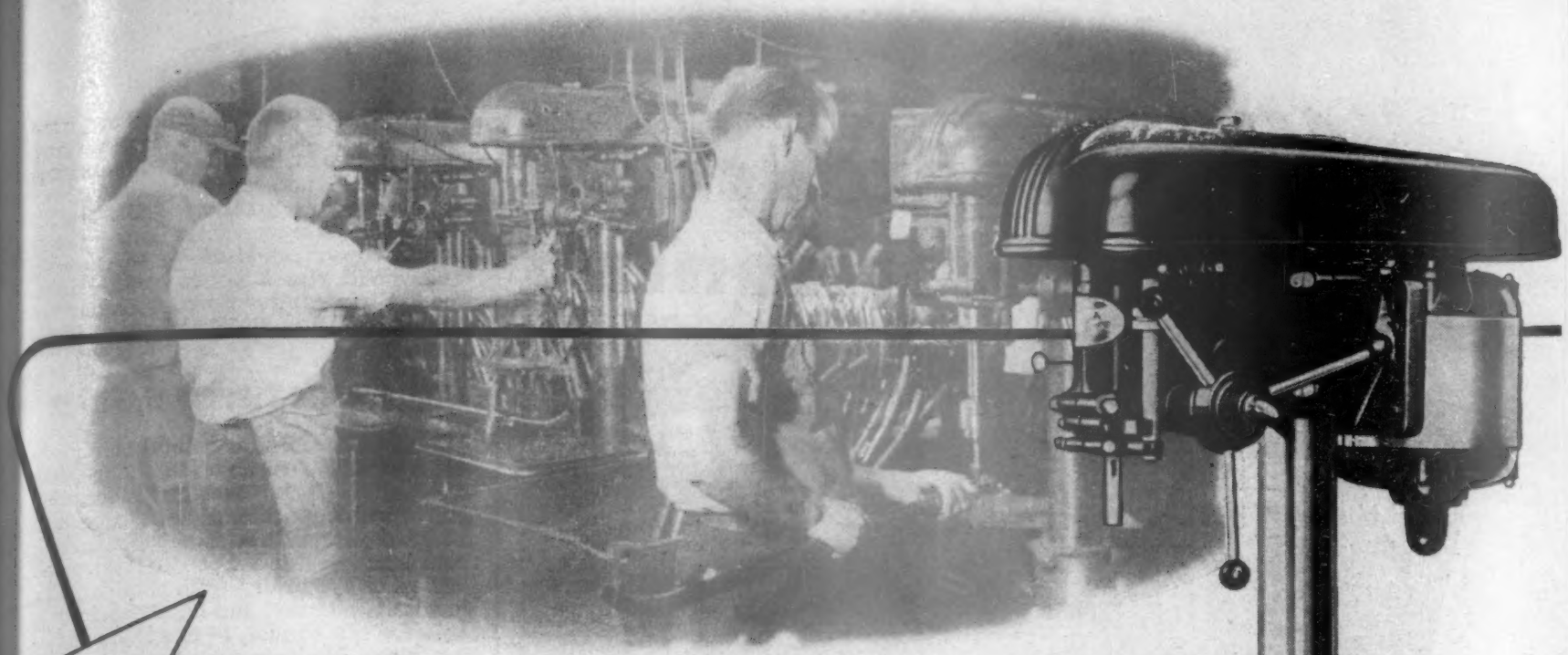


totally enclosed, protected self-ventilated or protected force-ventilated construction. It incorporates split frame of cast steel, silicone insulated armature coil conductors, wedges of Class B material to hold coils in slots, and rigid mounting of brush holders. Available in sizes from 5 to 200 horsepower, in voltages of 230 and 550, and in AISE dimension frames 602 to 618. Westinghouse Electric Corp., P.O. Box 2025, Buffalo 5.

HOT AIR GENERATOR

Producing homogeneous hot air of controllable velocity, temperature, quantity, and pressure, Thag hot air generator is adaptable for cleaning and drying machinery. Can be used for pre-heating, dehydrating, aerating, sterilizing, baking enamel, cooling (by shutting off the heat





CRACK DOWN ON COSTS

with the high-production flexibility of the Delta* 17″ Drill Press

Versatile Delta Drill Presses give you low-cost, trouble-free capacity for a wide variety of operations and set-ups

You can use a low-cost Delta 17″ Drill Press (single or multiple spindles) in dozens of operations in almost any plant. And wherever you use a Delta, *you can count on increased production—at lower costs!* That has been the experience of The Dumore Company, Racine, Wisconsin, manufacturer of precision tools and grinders—and it has been the experience of hundreds of other plants as well.

At Dumore, nearly 100 Delta Drill Presses are used for drilling, tapping, burring, spot-facing, and a variety of other jobs. Dumore's ingenious Delta set-ups suggest ways *you can streamline your plant operations for lower costs.*

The Delta 17″ Drill Press is engineered for accurate, fast production, and long, dependable service. Outstanding design and construction features give you exceptional value: Extremely accurate spindle with an exceptionally long bearing surface of spline to eliminate wear and retain original accuracy . . . pulley mounted on lubricated-for-life ball bearings . . . head- and table-raising mechanisms equipped with ball bearings . . . close-tolerance table surfaces . . . heavy construction throughout, with advanced design for correct weight distribution.

Send for a free copy of Bulletin A-17 today. Use the coupon below. Or ask your Delta distributor for further details on Delta 17″ Drill Presses. Your distributor is listed under "Tools" in the classified section of your telephone directory.

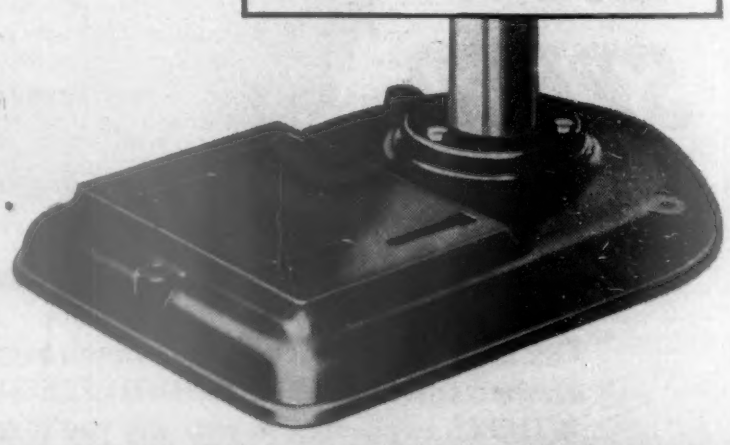
Delta 17″ Drill Press — available as single-spindle floor or bench-type, or 2 3, 4, 5, 6 and 8-spindle press, with one-piece or sectional tables.

Capacity: 3/4″ in cast iron.

Machines include: table-raising mechanism, streamlined belt-guard, built-in depth gage, depth scale on spindle return spring housing.

Spindle: No. 2 Morse Taper Spindle, or 1/2″ Jacobs Chuck Spindle.

Motor: Choice of 1/2, 3/4, or 1 HP for light, medium, or heavy-duty work.



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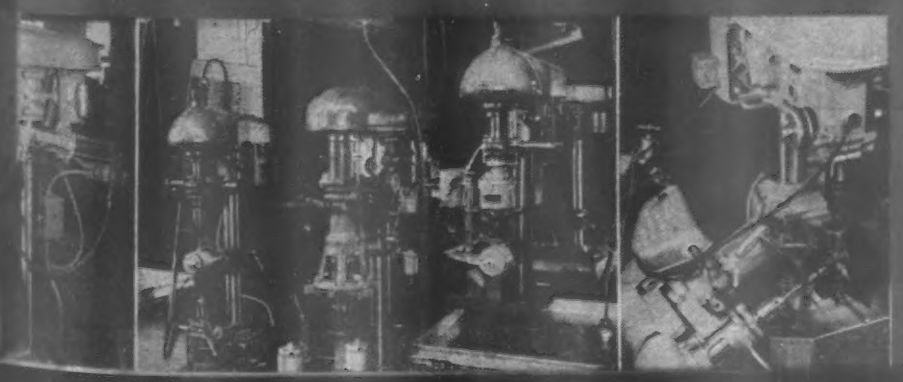
General Sales Office • 6 NORTH MICHIGAN AVENUE, CHICAGO 2, ILLINOIS



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Please send me Bulletin No. A-17 on Delta 17″ Drill Presses.

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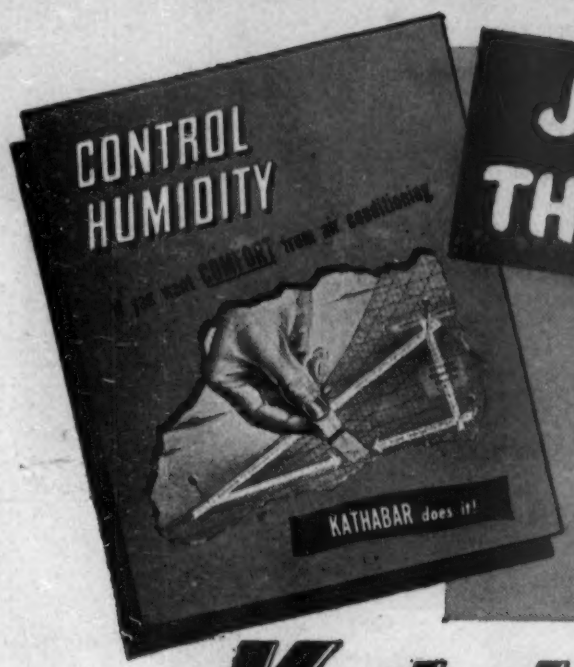
a *NEW* approach to air conditioning



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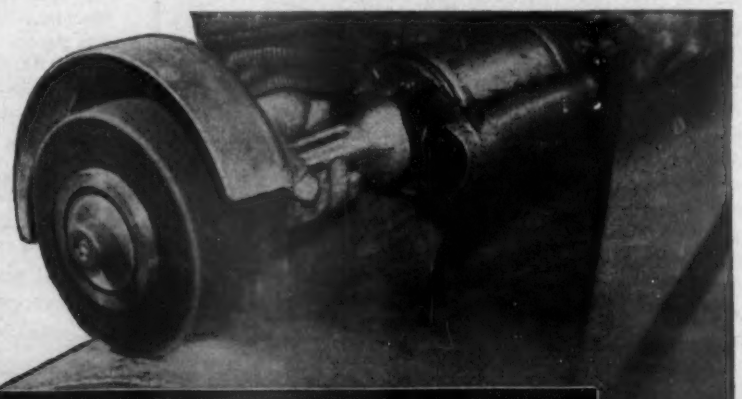
Kathabar System of HUMIDITY CONTROL

SURFACE COMBUSTION CORP. • TOLEDO 1, OHIO



HIGH SPEED SNAGGING

Get on with production. Do your snagging quicker, cleaner, *safer!* With Electro HIGH SPEED SNAGGING WHEELS *engineered to your job,* you'll see costs come down and volume of *better output* go up. These wheels work *on* anything *from* anything—swing frames, floor stands or portable machines. Full details illustrated in full color in our new Grinding Wheel Manual No. 645. Send for it *now.* It's *free.*

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344 DELAWARE AVENUE BUFFALO 2, NEW YORK

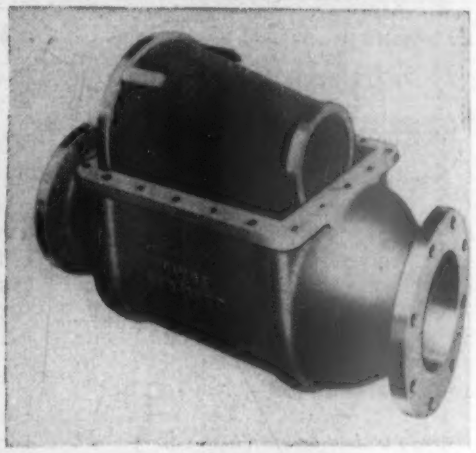
and using as a blower), tempering, curing, refining, and plating. The machine comes in two sizes: No. 1, with a rating of 350 deg. F., and capacity of 1000 c.f.m.; and No. 10 with a rating of 350 deg. F., and 10,000-c.f.m. capacity. Uses gasoline or No. 2 fuel oil, and has 6½-gal. capacity tank. Will run 5 hours continuously. Todd Shipyards Corp., Combustion Equipment Div., 81-16 45th Ave., Elmhurst, N. Y.

ALUMINUM-TIPPED HAMMER

Tips of the Kant-Mar hammer are made of a precision-turned aluminum alloy called Velv-Alum, and are replaceable after hard wear. The material is said to be tough, but soft, so as not to mar delicate surfaces, and also to reduce the hazard of eye injury from chipping. The handle is hickory, and head has an oval hole for the handle, to eliminate working loose. Made in two sizes, for light and heavy duty—8 and 32 ounces, with either replaceable or non-replaceable tips. Schmidgall Products, 307-11 Cass St., Peoria 2, Ill.

STRAINERS

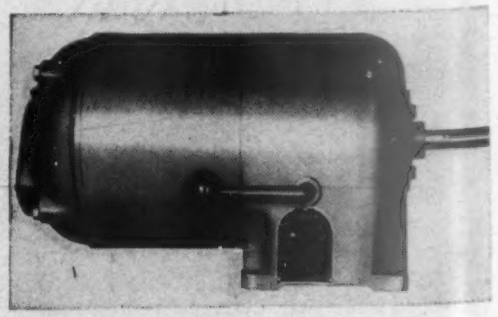
Known as Straight Line, strainers permit the liquid to flow in a direct line. They are installed in the suction line without offsets. The screen is in the form of a conical basket which slips in



and out of the case and seats itself by spring tension. Elimination of gaskets prevents leaking. Simplified cleaning, low pressure drop, and minimum turbulence factor are featured. Made in three sizes with capacities from 100 to 700 g.p.m. The Wayne Pump Co., Ft. Wayne, Ind.

GEARSHIFT DRIVE

Four-speed, Type R gearshift drive, with integrally mounted single-phase motor, is built to drive machinery requiring selective speeds. Available in ½-hp. at 1200 r.p.m., and ¾-hp. at 1800 r.p.m.



sizes. Gear ratios are 1 to 1, 1.33 to 1, 2 to 1, and 4 to 1. The units operate on 115 and 230 volts a.c., 50 and 60 cycle. The Lima Electric Motor Co., 601 Findlay Rd., Lima, Ohio.

slow speed, high torque portable electric power unit

This inexpensive, reversible, power unit, operating on either AC or DC current, develops, through slow speed gearing, a tremendous rotating power.

Portable and versatile — this CP tool is shown above operating as a flue roller, but it has many other uses, such as the operation of winches, gate valves, heavy drills, reamers, milling cutters, etc.

If you have an application that calls for a slow speed, high torque, extremely powerful, portable electric unit, write for further information on this CP specialty.

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General Offices: 8 East 44th Street, New York 17, N. Y.

ELECTRIC TOOLS • AIR COMPRESSORS • PNEUMATIC TOOLS • DIESEL ENGINES
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Does a Better Job at LESS COST

Used as vacuum cleaner, the Ideal 4-in-1 removes surface dirt from unit heater.

Prevent "dustruction" ..eliminate fire and explosion hazards with the new Ideal.

Continuous-duty universal motor delivers air at high velocity—blasts out hidden dirt. Or used as a vacuum cleaner, powerful suction sweeps up all particles. Perfect for spraying paint, lacquer, insecticides—also for drying purposes.

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Industrial Model

- BLOWS
- VACUUMS
- SPRAYS
- DRIES

Most Powerful "Hand-Type" Cleaner Made!

1½ HP motor blows large volume of dry air at 25,500 ft. per min. Complete unit weighs only 14½ lbs.—perfectly balanced—easy to carry and use—less operator fatigue. Quickly interchanged attachments provide for a wide range of vacuum cleaning, spraying, and drying jobs. Blower nozzle is standard. Medium-duty model also available—⅔ HP, 9½ lbs.

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more about the items on this page

Letters to the addresses given will bring you further information.

HAND-SIZE COMPUTER gives breaking strength, area, or p.s.i. for material planning and testing. One side covers rectangle to ¼ inch thick by ½ inch to 1½ inch wide; from 0 to 150,000 p.s.i. Reverse side covers rounds to 1 inch diameter; up to 100,000 p.s.i. Offered without charge by W. C. Dillon & Co., Inc., 5410 West Harrison, Chicago 44.

MAGNETIC PAPER TAPE, Hyflux, for sound recording, is used for maintaining inventory, records, control of fire and industrial equipment, and safety devices. Magnetic recording can be translated into sound, electrical, and mechanical energy. Indiana Steel Products Co., 6 North Michigan Blvd., Chicago 2.

CARBON REMOVER is cold-immersion degreaser named Formula 555. Formulated for all metals and engine parts. Contains no phenolic compounds, has a high flash point, and is claimed to be safe. Kelite Products, Inc., P. O. Box 2917, Terminal Annex Station, Los Angeles 54.

INTERCOMMUNICATION UNIT and radio combination designed to support four slave units may be operated on a.c. or d.c. Electronic Laboratories, Inc., Indianapolis.

SAFETY REMINDERS that can be stuck anywhere. Safe-T-Stickrs are 2x4 inches in size, in color, carry warnings to workers, can be peeled off as easily as they are stuck on. Howard Co., 15811 Denker Ave., Gardena, Calif.

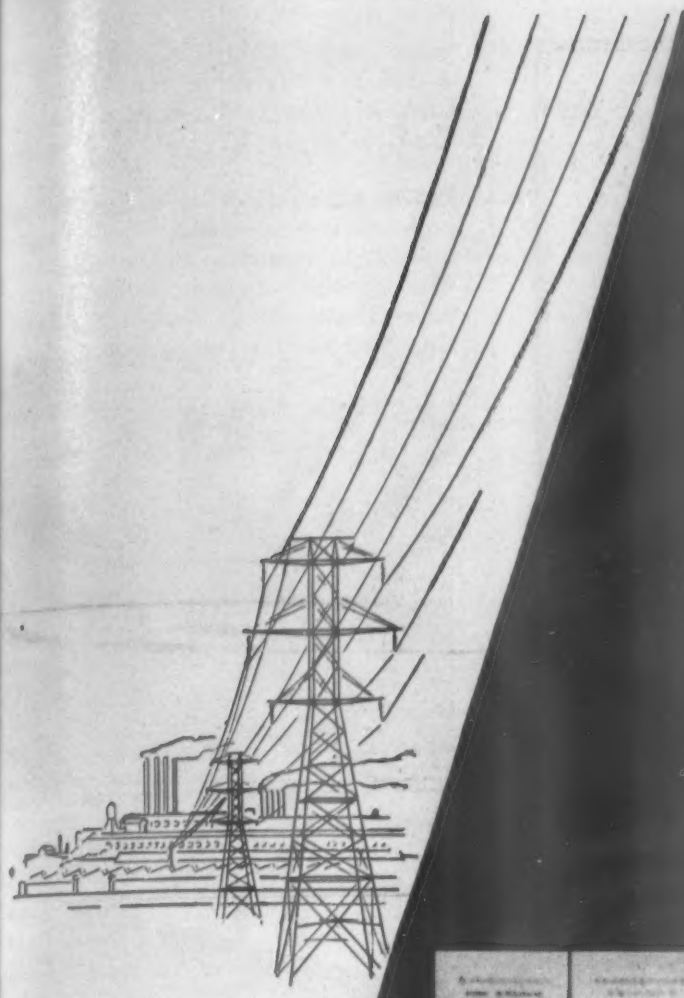
VISUAL CONTROL BOARD is used to portray facts and data. Colored plastic tapes show current status and provide permanent record. Made in sizes for 25 and 75 items. L. M. Osborne Co., 45 Second St., San Francisco

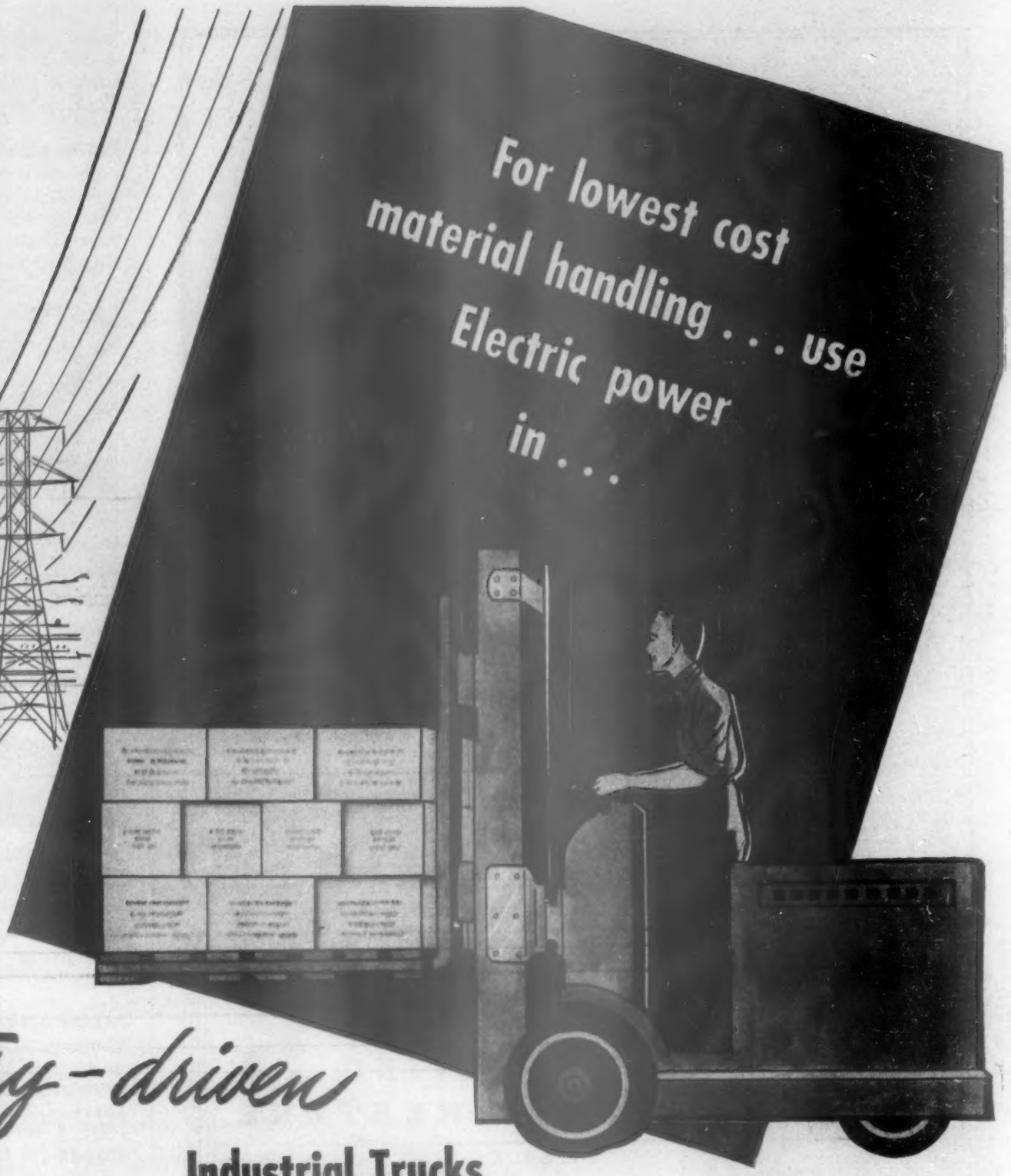
CRATING MATERIAL called Laminite, in channel box and angle form, is said to be comparable with wood in strength and durability with less than half the tare weight. Laminite Products Div., Criterion Paper Corp., 799 Washington St., New York 14.

RUBBER MAT consists of over 2000 rubber cones, ¼ inch high, which cushion the feet. Designed for safety and elimination of fatigue. Black, non-marking, 21¼ inches square. Avenue Manufacturing & Sales Co., 1859 North Milwaukee, Chicago.

FIRE-RESISTANT PAINT for application to combustible materials. Albi-R is said to surpass 20-min. burning test estab-

LIGHT CALCULATOR shows foot-candles and lumens required per lamp or fixture, or area per lamp or fixture, in single setting. Table on reverse side provides quick determination of room indexes for various room sizes and fixture mounting heights; chart of applicable fixture types and coefficients of utilization. Directions and sample problems attached. Ask for free Lightrule on letterhead. Champion Lamp Works, Lynn, Mass.





Battery-driven Industrial Trucks

Electric power has long since established top position for economy—and dependability—in the operation of industrial machines and processes. The fact that storage batteries make possible the use of low cost central station power on mobile equipment is one of the reasons why the *battery-powered* industrial truck consistently demonstrates an operating cost well under that of other types.

Materials flow easily, quickly, safely and at the lowest-cost per ton when handled with *battery-powered* self-loading industrial trucks.

Send

FOR THESE BOOKLETS . . .

Two illustrated booklets—MATERIAL HANDLING HANDBOOK and UNIT LOADS—may help you detect and correct excessive cost wherever you move or store materials.

The Electric Industrial Truck Association

2928F Forty-first Avenue, Queens Plaza, Long Island City 1, N. Y.

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Management Consultants

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UNIT HEATERS

insure complete

HEAT COVERAGE

ADVANTAGES OF WING REVOLVING UNIT HEATERS

1. Makes workers feel comfortable, live and invigorated — more productive.
2. Reaches over and around obstructions and into out-of-the-way corners.
3. Moving discharge heats up plant quickly on cold mornings.
4. Reduces absenteeism due to colds resulting from drafts, chills or overheating.
5. Is an excellent cooling system in summer with steam off and fans on.

NOT just another unit heater, the WING REVOLVING HEATER is unique in that it does what no other heater can do—its slowly revolving outlets gently distribute the heat continuously in a constantly changing direction. It reaches over, around and under obstructions and into out of the way corners. WING REVOLVING HEATERS are in many of the country's leading industrial plants.

L. J. Wing Mfg. Co.

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FACTORIES:

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lished under federal specifications SS-A-118. For interior or exterior use. Albi Chemical Corp., 15 Park Place, New York.

RESIN called Good-Rite Resin 50 is a high-styrene, low-butadiene copolymer for use in electrical insulation, protective coatings, injection moldings. Hycar Sales Dept., B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15.

SPRING-DRIVEN CENTER PUNCH features wide range, automatic control of force of impact. Weighs ½ ounce, is $\frac{5}{16}$x5 inches. For layout, scribing on metal or plastic. Satterlee Products, 755 Boylston St. Boston

INTERNATIONAL BUSINESS SERVICE for businessmen visiting Britain renders innumerable business, personal, and governmental services. British Information Services, 30 Rockefeller Plaza, New York.

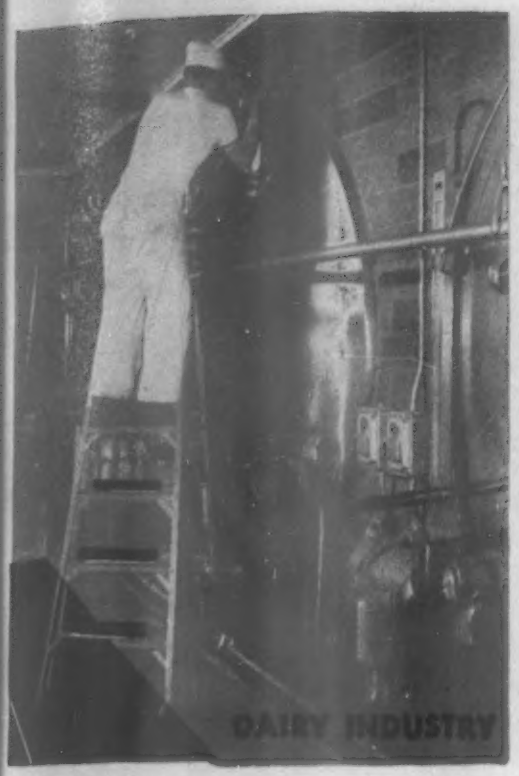
CODER for labels and wrappers. Operates electrically. Furnished to actuate on insertion, by foot pedal, or automatic cycle. Said to increase label legibility. Cummins Business Machine Corp., 4770 Ravenswood Ave., Chicago.

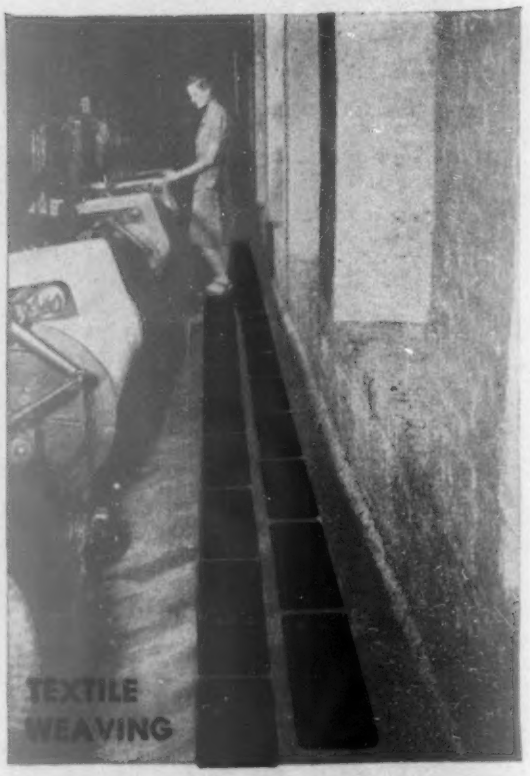
RADIO TUBE MANUAL for industrial electronic engineers contains basic application data for 545 types of tubes. Sylvania Electric Products, Inc., Radio Tube Div., Emporium, Pa.

WIRE SPLICING TAPE suitable for use on electrical circuits which come in contact with oil. Neoprene rubber compound in tape form, 30 feet by ¾ inch wide by 0.030 inch thick. United States Rubber Co., Rockefeller Center, New York.

TEN GREAT INVENTIONS, booklet, not copyrighted, for possible inspirational use in employee publications. The National Machine Tool Builders' Assoc., Cleveland.

PHOTOCOPY MACHINE turns out four 18x24- or sixteen 8x10-inch prints per minute. Foto Flo copies photographs,





Every industry with slippery floors *NEEDS* "SAFETY-WALK"

Falls caused by slipping can cause injuries that cost a lot of money in medical care—not to mention lost production time and, in the case of a key worker, serious disruption of manufacturing procedure.

Slippery areas can be slip-proofed quickly with "SAFETY-WALK." The total cost will be only a drop in the bucket compared with what slippery floors can cost in medical expenses and lost time.

If you suspect that slippery footing in your plant is costing important money, a "SAFETY-WALK" field man will call at your request and check into it with you. Write today—there will be no obligation.

SAFETY-WALK
BRAND
WETORDRY NON-SLIP SURFACING
REG. U.S. PAT. OFF.
MINERAL COATED FABRIC

Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
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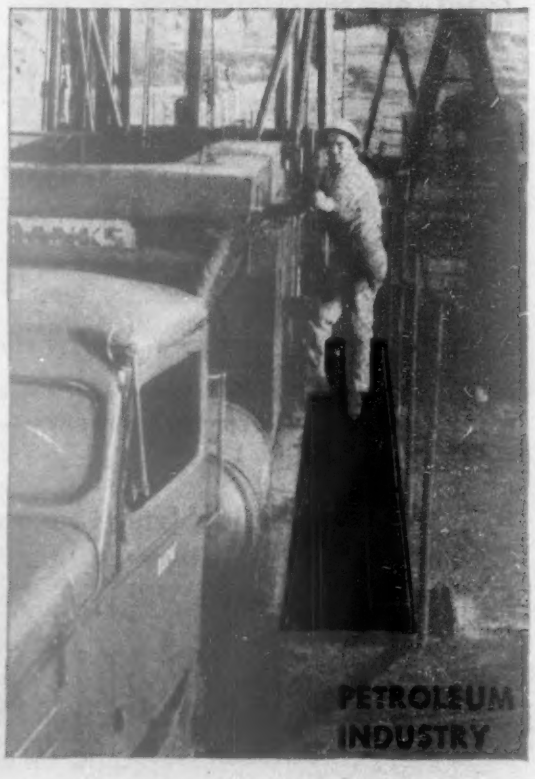
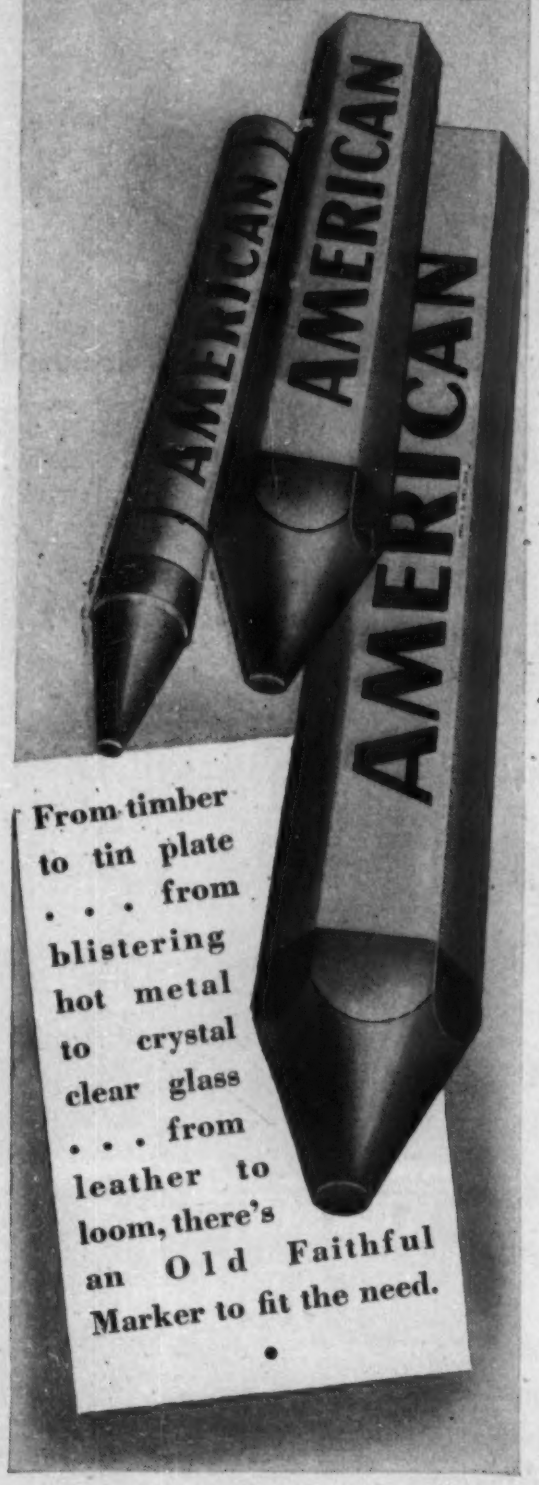


GUARANTEED TO FIT THE NEED



From timber to tin plate . . . from blistering hot metal to crystal clear glass . . . from leather to loom, there's an Old Faithful Marker to fit the need.

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It costs no more to use the *right* marker. American Markers are guaranteed by crayon experts—in business 112 years.

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NEW YORK SAN FRANCISCO DALLAS

drawings, and records. Can be used to make microfilm enlargements. The Haloid Co., Rochester, N. Y.

PORTABLE WATER CARRIER of stainless steel, is insulated. Recessed faucet turns off when released. Lug is provided for single or double unit Vortex paper cup dispenser. Double unit dispenser has receptacle for used cups. Has 4-gal. capacity and is 18x15x8 inches. Dixie Cup Co., Easton, Pa.

PROBE MAGNET is designed for many industrial and first aid uses. Housed in plastic case. Strength can be automatically adjusted. Eljay Enterprises, P. O. Box 891, Newark 1

GAGES said by maker to outwear chrome-plated gages by 4 to 6 times. Worn gages rebuilt to size. Rite-O Tool & Gage Co., 59 East Eight Mile Rd., Hazel Park, Mich.

FILMS:

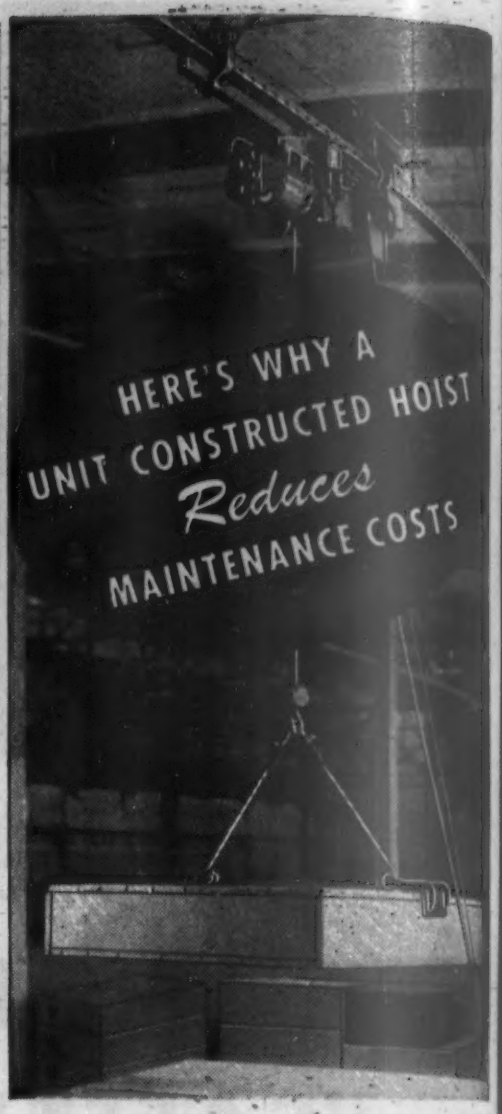
Radio Frequency Heating is 40 min., 16 mm. sound film. Part 1 explains theory of induction heating. Dielectric heating is explained in Part 2. Examples of each are shown. Film Section, Westinghouse Electric Corp., 511 Wood St., Box 868, Pittsburgh 30

Infra-Red Lamps for Better Production, colored sound film strip, shows how infra-red radiant energy can be applied to industrial processes to speed production, improve quality, and working conditions, and save space. General Electric Co., Lamp Dept., Nela Park, Cleveland.

Catalog of slidefilms and motion pictures, lists visual teaching aids and slidefilm kits, sound slide films, educational sound motion pictures for vocational training, workshop, industrial, and classroom use. The Jam Handy Organization, 2821 East Grand Blvd., Detroit 11.

Looking Ahead Through Plexiglas, 16 mm., 30-min. film, in color and black-and-white. Highlights the development of Plexiglas. Rohm & Haas Co., Washington Sq., Philadelphia, Pa.

Golden Horizons, 16 mm., 33-min. film in sound and color, depicts history and development of copper-base alloys. User pays transportation one way. Ampco Metal, Inc., Milwaukee 4.



● Maintenance men know from experience how little it costs to service a hoist that is simple in design. That's why it will pay you to switch to the simple construction of a Reading UNIT CONSTRUCTED Electric Hoist.

The hoisting unit in a Reading Electric Hoist has only four moving parts. The result is fewer wearing parts, fewer parts for you to overhaul or repair. Then too, each one of the four hoist units—suspension, motor, control and hoisting units, can be removed for maintenance purposes without the time-consuming "break-down" of any other unit.

Assure yourself of these cost-reducing advantages—contact your nearest Reading Hoist distributor, today. And for full details on the Reading UNIT CONSTRUCTION Plan, write us for your free copy of "144 Answers To Your Hoisting Problems."

READING CHAIN & BLOCK CORPORATION
2103 ADAMS ST., READING, PA.
CHAIN HOISTS • ELECTRIC HOISTS
OVERHEAD TRAVELING CRANES

READING HOISTS

for stronger, safer assembly . . .

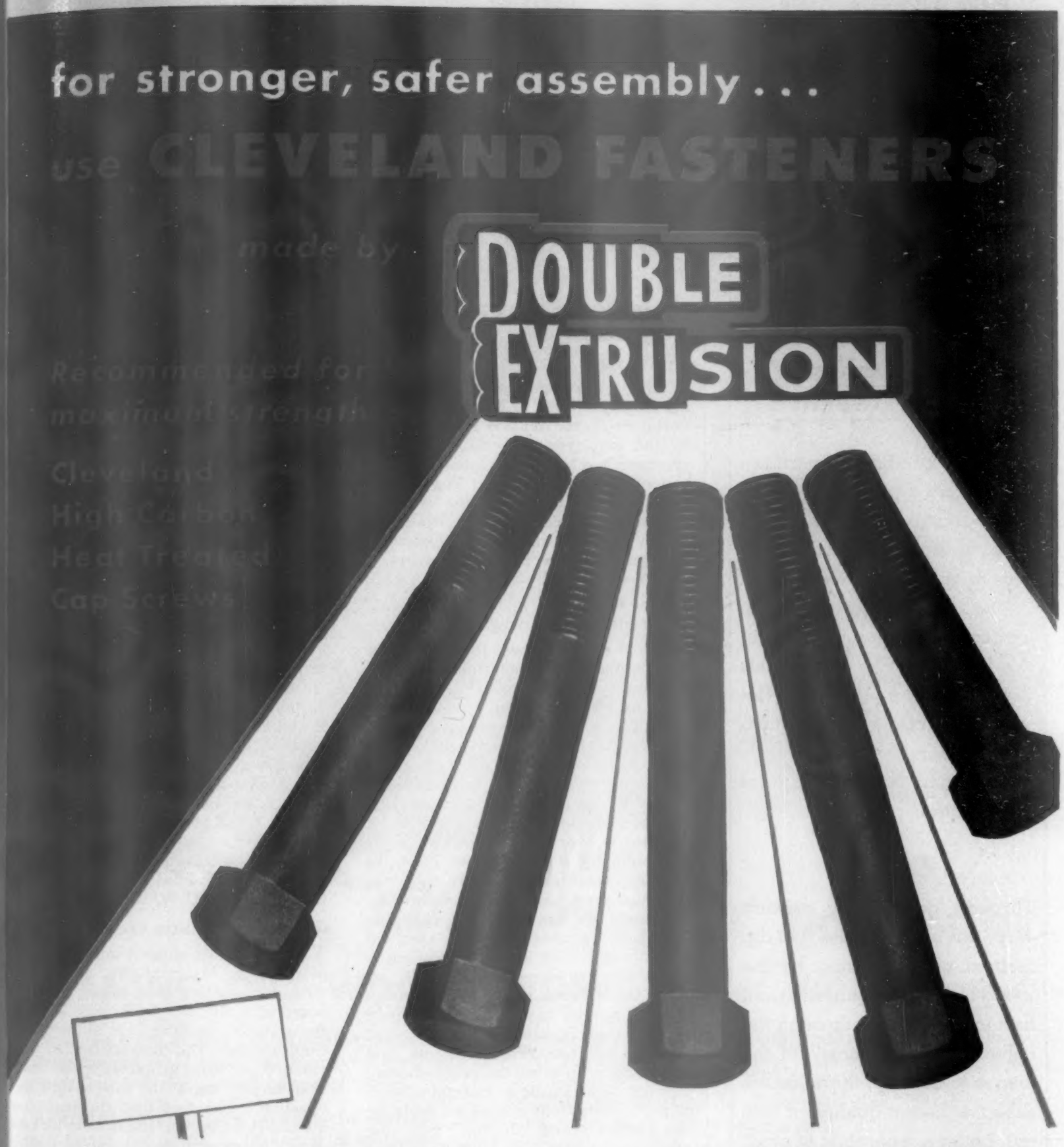
use CLEVELAND FASTENERS

made by

DOUBLE EXTRUSION

Recommended for maximum strength

Cleveland High Carbon Heat Treated Cap Screws



Double Extrusion—the manufacturing method applied to fastener production through the Kaufman Process—works the steel with less strain and distortion to grain structure; toughens surface sections while preserving the interior ductility. Heads will not shear or crack. Size and shape are held to remarkably close tolerances.

The most all around satisfactory fastener you can obtain is the Cleveland High Carbon Heat Treated Cap Screw—a dependable fastener of maximum strength and good appearance. Its black satin-like finish has rust-resisting qualities. It's more than worth the slight extra cost over 1020 bright screws. Write for catalog and prices.

ASK YOUR JOBBER FOR CLEVELAND FASTENERS

The Cleveland Cap Screw Company

2917 EAST 79TH STREET • CLEVELAND 4, OHIO

Warehouses: Chicago and Philadelphia

CLEVELAND *Top Quality* FASTENERS

MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY

American Hot Dip Galvanizing is Your Assurance of the Utmost in Rust Prevention

In 1935 a number of America's leading hot-dip job galvanizing plants recognized the need for the establishment of strict standards of quality, service, and an inflexible adherence to the highest ethical practices within the industry . . . Out of this need grew the American Hot Dip Galvanizers Association, whose membership extends from Maine to the State of Washington.

★ ★ ★ ★

Through consistently seeking ways to improve the hot-dip method of galvanizing by the use of improved equipment and best materials, and through the collective "know how" of the total membership, there has resulted a better quality of output, better appearance of product, and more efficiency in production processes.

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Write for membership roster and the Association's specification portfolio. Address: The Secretary,

AMERICAN HOT DIP GALVANIZERS ASSOCIATION, INC.
FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PA.

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: July 1 to August 1

TREND INDICATORS
Wage-Hour

RELEASE VALID

A release, executed by an employee to his employer prior to enactment of the Portal-to-Portal Act and after payment by the employer of a claim for back overtime pay and liquidated damages under the Wage-Hour Act in full payment of his claim for overtime, is binding on the employee unless it can be shown that the release was procured through fraud or duress. (Connors v Chemical Construction Corporation; NYSC Spec. Term)

EFFECT OF BONUS ON OVERTIME PAY

Where it can be shown that there was no agreement or arrangement between the employer and employees for payment of the bonuses, payment was dependent upon earnings of the corporation, and the payments were voted by the company's board of directors after the services had been performed by the employees, year-end and quarterly bonuses did not have to be reflected in overtime pay. Such bonuses are distinctly different from incentive bonuses, which are definitely a part of the employees' base pay. There was no agreement or arrangement to pay the bonuses; they covered a period that had partially or wholly expired. (Walling v. Adam Electric Company; CCA-8)

On the other hand, where the employees' regular pay consisted not only of their hourly rates or salaries, but also of profit-sharing payments and commissions on sales, the profit-sharing payments were made at the end of each calendar year from a fund set aside by the employer for "sharing" with the employees and the individual allocations were based upon the past performance and present hourly rate or salary of such employee, such payments must be included in the base rate. (McComb v. Paulson; USDC N. Ill.)

Likewise, bonus payments paid pursuant to resolutions of the employer's board of directors were not part of base pay where the amount paid to each employee was based, in general, on the length of service and the hourly rate. These bonus payments were of a discretionary type, not to be reflected in overtime payments. (McComb v. Shepard Niles Crane & Hoist Corporation; USDC W. N. Y.)

VOLUNTEER WORKER HELD NOT EMPLOYEE

A volunteer worker who kept a record of the time he worked, but did not exhibit it to the employer until the last week of his employment, refused to be placed upon the payroll, and did not present the employer with his social security number, is not entitled to back pay, since he was not an employee. The mere fact that the Act defines the term employ—"to suffer or permit to work" does not make a volunteer an employee. (Rogers v. Schenkel; CCA-2)

CONSTITUTIONALITY OF PORTAL-TO-PORTAL ACT UPHELD

The retroactive features of the new Portal-to-Portal Act have been upheld as constitutional. Since the federal district and circuit courts of appeals are purely creatures of Congress, Congress may both add to and subtract from their jurisdiction without exceeding its constitutional prerogatives. In the first case sustaining the constitutionality of the Portal Pay Act, the court held there was no unconstitutional deprivation of vested property rights in the outlawing of the portal-pay claims. The fight of employees to maintain back wage suits under the Wage-Hour Act is a mere "statutory" right, which was granted, and may be taken away, by Congress. (Cochran v. St. Paul & Tacoma Lumber Company; USDC W. Wash.)

WAGE CONTRACT HELD VALID

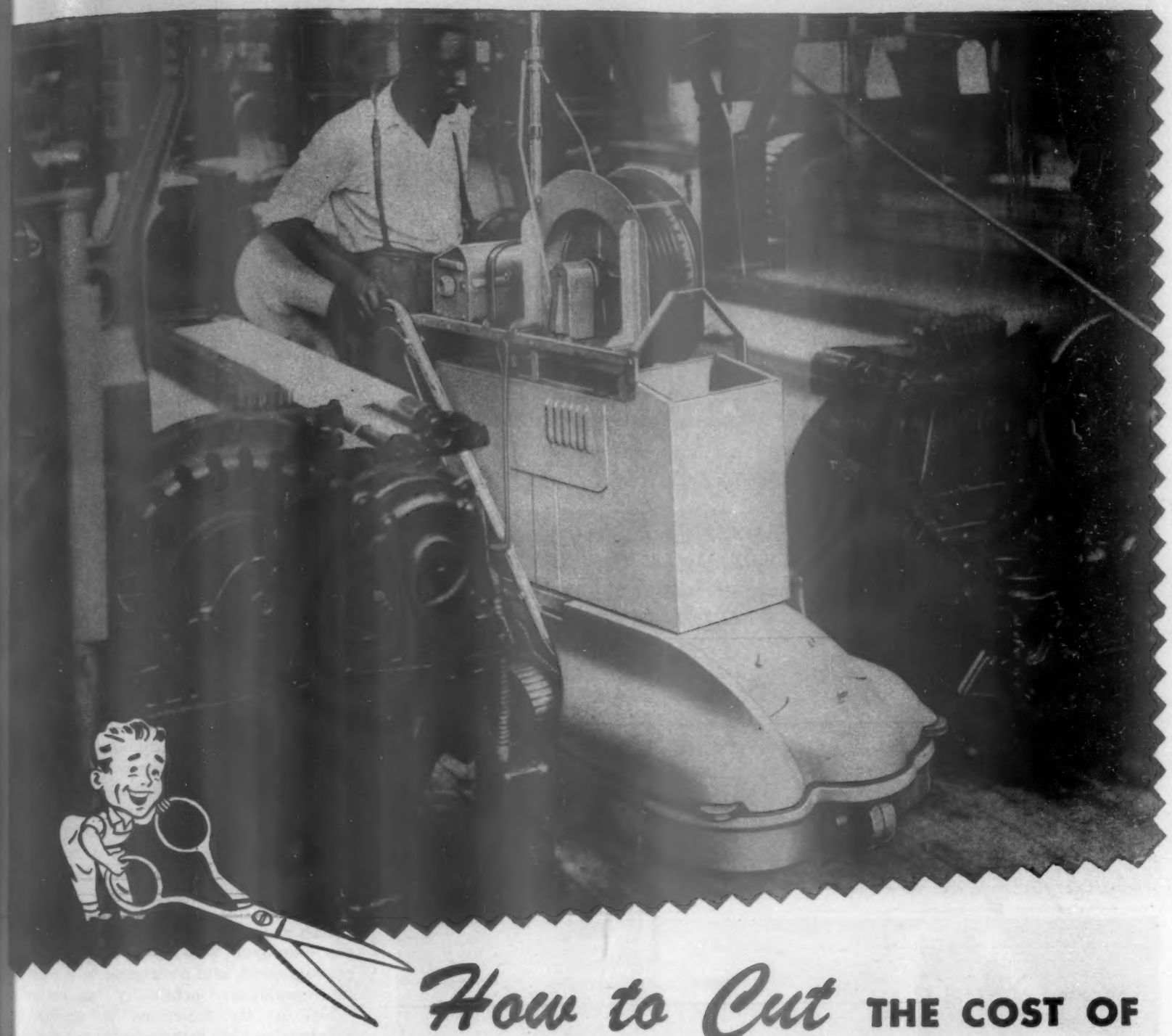
A wage contract entered into by an employee with his employer, which provides for a guaranteed salary of $47.50 based on a 50-hour week is valid, since the statutory regular rate of pay is 95 cents an hour. The contract further provided that "time in excess of 50 hours shall be paid for at the rate of time and one-half." The fact that the employee did not raise any questions as to his rate of pay for several years, and until after he severed his employment, shows the interpretation he gave to the agreement. Where the terms of a contract are ambiguous, the interpretation given it by the parties carries much weight with the court. (Eichman v. Wisconsin Leather Company; USDC E. Wis.)

LABOR-MANAGEMENT RELATIONS

*** DISCHARGE HELD DISCRIMINATORY**

An employer's discharge of a militant and popular union leader was held to be discriminatory despite the employer's

*In this classification, items marked with an asterisk also are considered to be trend indicators.



How to Cut THE COST OF CLEANING OILY WOOD FLOORS . . . *And Aid Production!*

In seeking ways and means of aiding cost-reduction, management will look to improved methods and equipment for the maintenance of floors.

Important savings are possible in cleaning large-area floors by using high-speed mechanical equipment that both scrubs and picks up in a single operation . . . and by using in such a machine a cleanser designed for the greater speed of mechanical scrubbing.

The *Finnell Scrubber-Vacuum* illustrated, and *Setol*, the mineral oil solvent specially compounded for machine-scrubbing, are an unbeatable team for fast, low-cost cleaning of oily wood floors. This *Self-Propelled Finnell* is a complete cleaning unit *all in one*. It applies the cleaning solution, scrubs, rinses if required, and picks up. Has a cleaning capacity of approximately 8,750 sq. ft. per hour!—a speed that *Setol* matches in *cleaning action*. *Setol* emulsifies grimy oil and grease *instantaneously*. This cuts operating time of the machine, which in turn reduces labor costs and saves on brushes. *Clean floors are safer floors* . . . bolster worker morale and thereby aid production!

For free floor survey, consultation, or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2509 East St., Elkhart, Ind. Canadian Office: Ottawa, Ont.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

CLARK *Electric Fork Trucks cost less!*

. . . BECAUSE OF ECONOMIES RESULTING FROM MASS PRODUCTION OF MAJOR UNITS IN CLARK'S OWN PLANTS—ASSEMBLY-LINE PRODUCTION OF FORK TRUCKS, BOTH ELECTRIC AND GAS-POWERED—MAXIMUM INTERCHANGEABILITY BETWEEN GAS AND ELECTRIC MACHINES OF LIFT MECHANISMS, AXLES, WHEELS AND MANY OTHER PARTS.

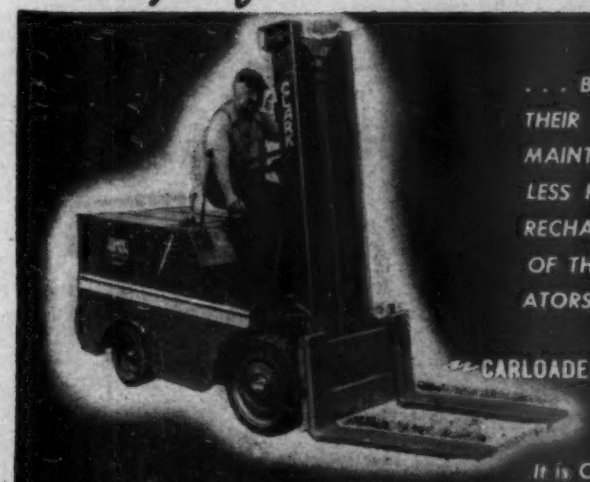
TRUCLOADER—CAPACITY 1,000 lbs.

CLARK *Electric Fork Trucks are unexcelled!*

...BECAUSE OF IMPORTANT CLARK-PIONEERED DEVELOPMENTS IN ALL MODELS—AMONG THEM: COMPLETE HYDRAULIC LIFT SYSTEMS—36-VOLT DRIVE MOTORS—COMFORTABLE SEATS FOR DRIVERS—AUTOMOTIVE TYPE CONTROLS AND STEERING—4 SPEEDS FORWARD, AND REVERSE—BATTERY CAPACITIES RICH IN RESERVE POWER—UPRIGHTS FORMED FROM STEEL PLATE.

CLIPPER—CAPACITY 2,000 lbs.

Users prefer CLARK *Electric Fork Trucks!*



. . . BECAUSE THEIR INITIAL COST IS LOW—THEIR OPERATING COST IS LOW—THEIR MAINTENANCE COST IS LOW—THEY CONSUME LESS POWER AND DO MORE WORK BEFORE RECHARGING IS NECESSARY . . . AND BECAUSE OF THEIR EASE OF OPERATION, MOST OPERATORS PREFER THEM.

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contention that the discharge was because of absenteeism and insubordination. The discharged employee was a highly skilled workman, filled one of the key positions in the employer's plant, and received the highest rate of pay. He was also popular and influential among the employees. The alleged reasons given by the employer for the discharge lay in the employer's vehement opposition to the union and in his realization that the discharged union leader represented a continuing threat of unionization. The record did not indicate, outside of a single incident, the facts in dispute—that the discharged employee was insubordinate in his attitude or refused to obey instructions given him by his supervisors. (Newman Machine Company, Inc., and United Steelworkers of America; NLRB)

*** WAGE INCREASE HELD UNFAIR LABOR PRACTICE**

An employer who announces a wage increase on the very eve of a crucial election tends to undercut the prestige of the union appearing on the ballot, and the utilization by an employer of such economic inducement warrants setting aside the results of the election. In this case, the record disclosed no reason why the employer could not have postponed the announcement until after the election. The announcement of the wage increase, particularly in view of its timing, tended improperly to influence the voting of the employees. (Gaylord Products, Inc., and United Automobile, Aircraft, & Agricultural Implement Workers of America; NLRB)

*** HELD DOMINATION**

An employer who gave approval, encouragement, and assistance to a club of its employees originally exclusively social in its functions is guilty of domination and interference, where the club, after its organization, assumed some of the functions of a labor organization. Although the activities of the club were originally social, it did not long restrict itself to social activities. The board of control was called upon to take action on complaints of the members about working conditions. A letter to the board of governors of the club, written by the superintendent, stated that the company would be glad to discuss personal or company matters with them. Thereafter on at least three occasions the board of control met with representatives of management to discuss grievances, wages, or working conditions. The National Labor Relations Act defines a labor organization as "any organization of any kind in which employees participate and which exists for the purpose, *in whole or in part* of dealing with employees concerning grievances, labor disputes, wages, rate of pay, hours of employment, or conditions of work." The club's activities in seeking and procuring an increase in pay, in presenting a grievance on behalf of an employee, and in discussing working conditions with management, clearly brought it within the scope of this

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definition. Even if it can be assumed that the company's intent was merely to aid the club in its social activities, this cannot alter the fact that the company's conduct in interfering with the formation and administration of the club and giving it financial and other support was violative of the act. (Detroit Edison Company and Utility Workers Union of America; NLRB)

*** HELD NOT REFUSAL TO BARGAIN**

An employer is not guilty of refusing to bargain where he endeavored to discuss with the union the subject upon which the union centered its interest, and was also willing to discuss any other proposals of the union for inclusion in the contract. The board reiterated its position that, "There is no precise formula which must be followed by an employer and a labor organization in conducting collective bargaining negotiations. To a great extent, each case depends upon its peculiar facts." When a union remains adamant, insisting that its terms alone may be incorporated into a contract, the employer fulfills his duty by considering those terms honestly, and accepting or rejecting them. (Anelen Realty Corporation and Building Service Employees International Union, NYLRB)

*** HELD VIOLATION OF CONTRACT**

A union and its members who violated the no-strike pledge of their contract were found guilty of breaching their contract where the officials of the local union participated in the strike and the union, instead of taking affirmative action to end the strike, has admittedly endorsed it by financial help and in other ways. A union which is a party to the no-strike clause has the obligation to find means to compel workers engaging in the stoppage to comply with the contract. Damages were assessed against the union and the participants in the strike banned by contract. "The economic power and the legal status of labor unions require a commensurate degree of responsibility. The union must accept the view that the collective bargaining agreement is a compact setting forth mutual rights and obligations for a specific period and not simply a document of restrictions on the common-law rights of management." Where the union chooses to endorse and aid the action of its members engaging in a work stoppage, it must share the responsibility and the consequences for such illegitimate actions. (In re arbitration between The Brynmore Press, Inc., and United Paper, Novelty & Toy Workers)

*** STRIKE FOR MAINTENANCE OF MEMBERSHIP HELD UNLAWFUL IN MASSACHUSETTS**

A strike, the purpose of which was to secure the retention of a maintenance-of-membership clause in the contract, was held unlawful. The provision is, in substance, a means to provide union security. A strike for its inclusion in an agreement with an employer is designed to afford augmented strength to the un-

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The "METALMASTER" 680!

Double Motor–Double Spindle
2 Independent Heavy Duty Tools in 1

This newest Bradford Buffer-Polisher incorporates two separate, individual machines on one base—using *less* space than normally required for two machines. Two motors drive separate spindles. Thus two operators can work independently or two successive or different jobs can be handled without readjustments. Spindles may have different speeds. Motors are located in the base, mounted on individual platforms, adjustable to maintain correct drive belt tension.

Bradford's 15 versatile buffer models, in a wide range of power capacities, permit you to select the *right* tool for your requirements.

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Illustrated are two types of grinders from the *complete* Bradford line. In all, 15 types of bench and pedestal grinders are produced to serve a wide variety of grinding operations.

Modern design, highest quality materials and precision manufacture distinguish *Bradford* Tools. As a result, those shops that demand quality production, long service, low cost and efficient operation from their tool investment, are *Bradford* equipped. Ask your Bradford distributor for complete specifications on Bradford Tools designed to your production requirements.

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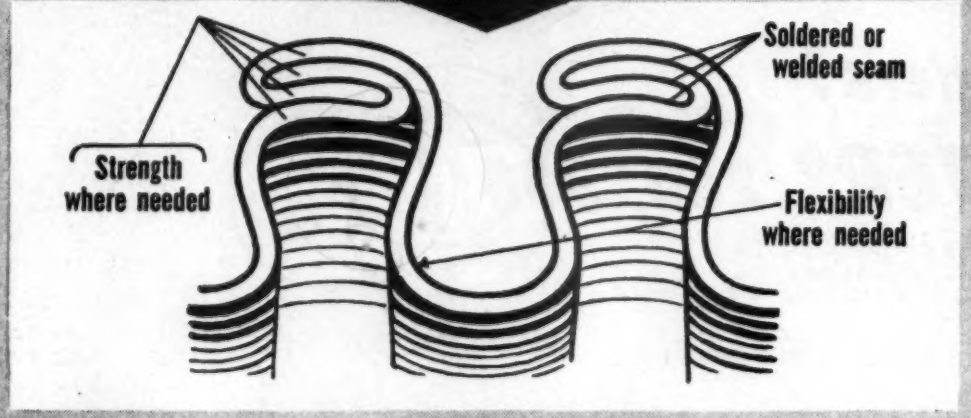
When the going is ROUGH

Titeflex stands up



The drawing above illustrates exactly why Titeflex all-metal flexible tubing stands up under the most rugged conditions.

Note that there are *four* thicknesses of metal at the top of each convolution—right where the greatest wear is encountered.

Note that flexibility is achieved by wall construction without deforming or stretching the metal. There are no packed, sliding joints to wear out or decompose.

Note that the metal strips are soldered tightly together to prevent leakage of both gases and liquids.

Note that Titeflex tubing is *all metal*—it is unaffected by gas, oil or liquids . . . and withstands high temperatures. Yet it is fully flexible and holds up under excessive vibrations.

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ion and cannot be held as a lawful strike. The fact that union membership is not compulsory, as it is under the closed shop, is only a difference in the degree of security.

The union may not picket the plant of its employer under the guise of free speech. The court found there had been substantial and irreparable damage to the company's plant; the injury to the company's property had been greater than that to the union and that if relief was denied, the injury to the company would be greater than the benefit to the union.

The company had not failed to comply with any obligation imposed by law and made every effort to settle the dispute by negotiation with the aid of governmental machinery. (Colonial Press, Inc. v. Ellis; Mass. Sup. Jud. Ct.)

EMPLOYEES ELIGIBLE TO VOTE

Persons hired on a permanent basis by a company to replace employees on strike, in the absence of an unfair labor practice charge, are entitled to participate in an election directed by the state labor relations board. Such replacements are employees and their interests are of a substantial nature. (Daymon Paper Products Company and United Construction Workers, United Mine Workers of America; Conn. Labor Relations Board)

RIGHT TO DEMAND ARBITRATION BARRED

Under a contract clause providing that "any employee who is discharged shall have the right to appeal his discharge, but notice in writing of such appeal must be given to the employer within 3 days of such discharge," an employee's right to demand arbitration of his discharge is barred where he failed to give his employer the required notice. Such provision in the agreement is, in effect, a statute of limitations.

The right to demand arbitration is barred by the failure to give the required notice within the time prescribed. Such a requirement is more than a technicality; it is a contractual right, and is one of substance. (Ketchum & Company, NYSC Spec. Term Part 1)

* AWARD OF ARBITRATOR IS FINAL

The court cannot set aside the award of an arbitrator for mere errors of judgment either as to the law or as to the facts. Provided the arbitrator keeps within his jurisdiction and is not guilty of fraud, corruption, or other misconduct, his decision is final, and, however disappointing it may be, the parties must abide by it. In addition to the rule of law, the contract contained a clause whereby the parties agreed to submit to arbitration any dispute arising between them "concerning the application or interpretation of any provision of this agreement or concerning any term or condition of employment or otherwise." The clause further provided that the decision of the arbitrator "shall be final and binding upon the parties hereto." (Motor Haulage Company v. Teamsters

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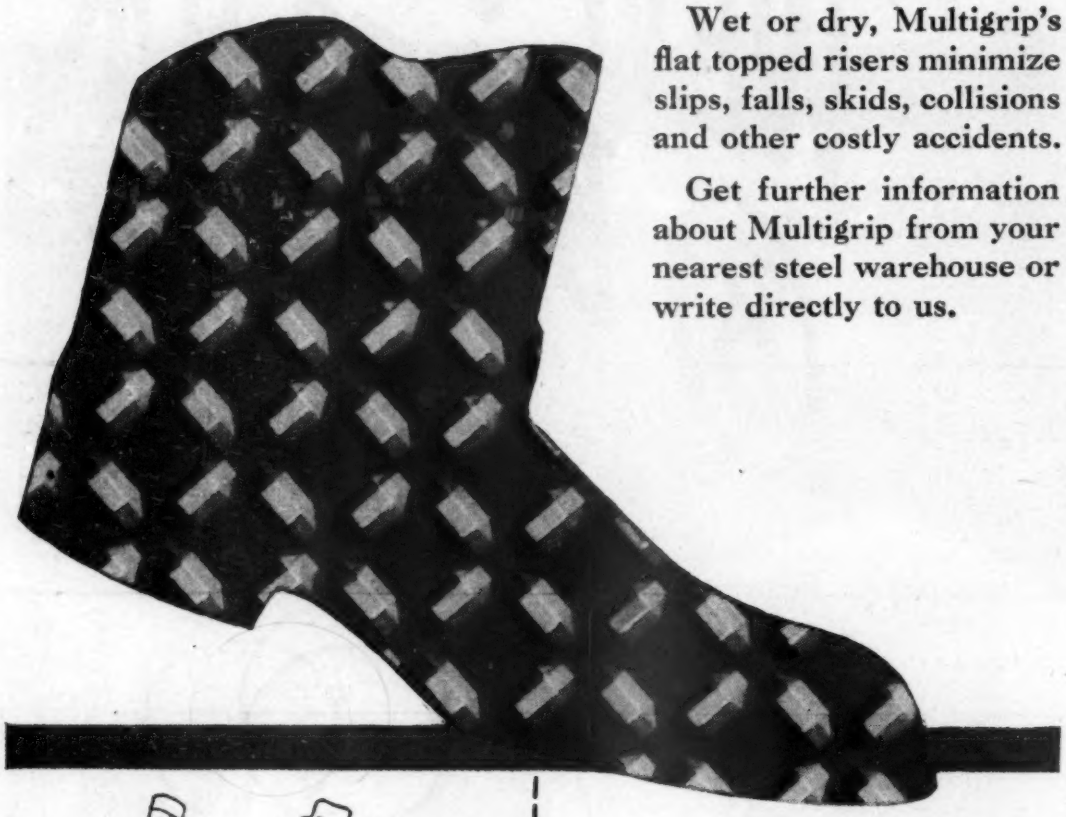
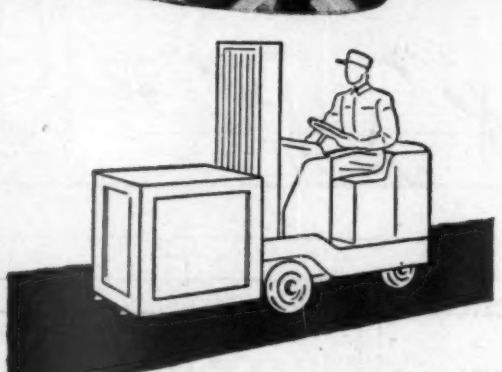


FLOORS LAST LONGER



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Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
7-997

UNITED STATES STEEL

Union; NYS.C. Appellate Div. First Dept.)

*** ARBITRATOR MAY NOT SET RATES**

Where a contract contained no regular wage schedule, but only established minimum hiring rates and provided that "the present wage rate of all employees, except as revised by this agreement, shall continue without reductions for the life of the agreement," an arbitrator is not empowered to set any rate applicable to any job. The contract did not contain any reference to jobs or rates applicable to them, In fact, the section of the contract quoted above indicates clearly that the employees' individual rates and not job rates were provided for. The company and the union had not negotiated any job rates before entering into contractual relations, and the contract did not provide for the setting of rates for any employee. If the arbitrator set a rate, he would, in effect, be writing a contract provision which the parties did not intend that he should have the authority to do. (In re arbitration between Essem Packing Company and United Packinghouse Workers of America)

*** EMPLOYEES ENTITLED TO EIGHT HOURS' PAY FOR HOLIDAY FALLING ON SATURDAY**

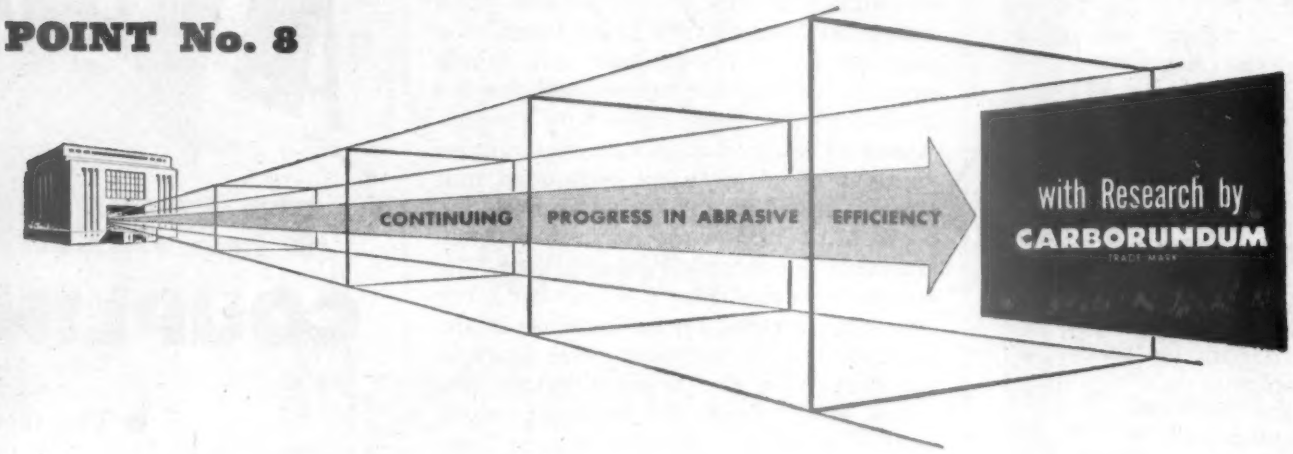
Where the contract provided that employees are to receive eight holidays with pay, employees are entitled to eight hours' pay for a holiday, despite the fact that the holiday falls on a Saturday, which is normally a 4-hour work day. In this particular case, the employees worked five days of eight hours each during the week of February 17, but did not work on Saturday, February 22, which was George Washington's Birthday. Under the terms of the contract, if a holiday fell on Saturday, the work week was only reduced to 40 hours. The union claims that if the 36-hour work week had been maintained the company would have to pay four hours' overtime at the rate of time and one-half when the employees worked 40 hours in a week when a holiday fell on Saturday, and that under the contract the employees were entitled to a full day's pay of eight hours for a holiday, regardless of whether the holiday fell on Saturday or any other day of the week. If there were any intent that these employees were to receive pay for four hours when the holiday fell on Saturday, it was not specifically set out under the contract. It would not be feasible or equitable to punish the employees just because a holiday falls on a Saturday. (In re arbitration between Safeway Stores, Inc., and International Brotherhood of Teamsters, Chauffers, Warehousemen & Helpers of America)

*** EMPLOYER OBLIGATED TO OBSERVE TERMS OF CONTRACT**

Where no evidence of fraud or duress can be found in the consummation of a contract, an employer is obligated to observe its terms even though he claims that a certain clause was incorporated without his knowledge. Under a con-

A BUYING GUIDE FOR ABRASIVES

POINT No. 8



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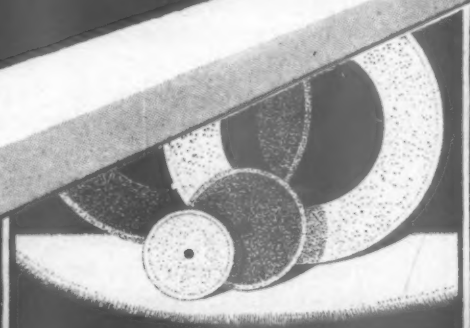
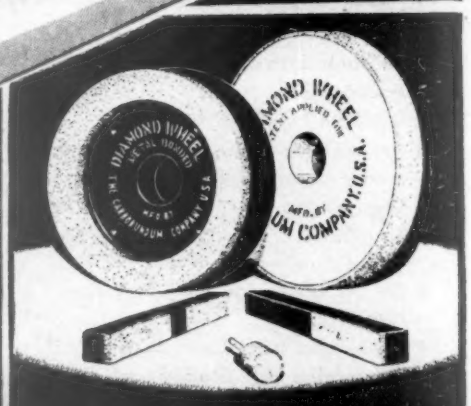


Specialized wheels by CARBORUNDUM for thread grinding



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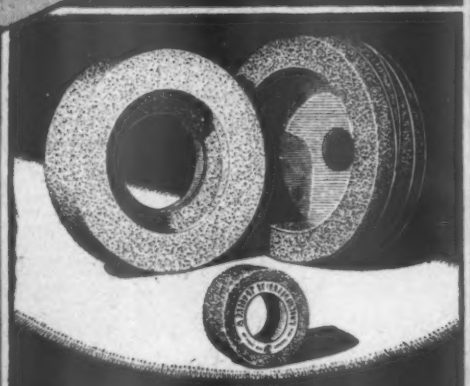
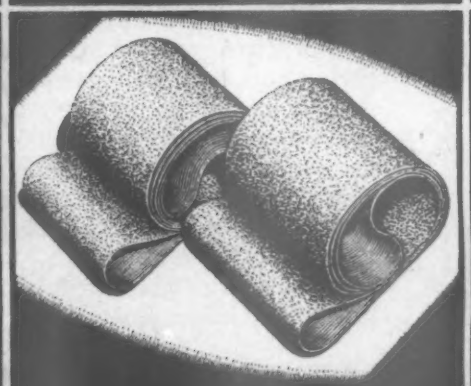


Cool-cutting green grit wheels for cemented carbide



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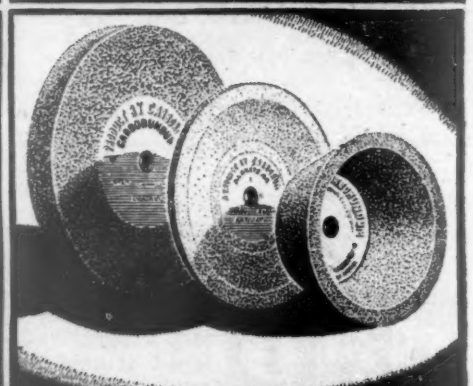

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tract clause providing that the employer will discuss with the union fair and equitable increases in commissions "whenever there will be a rise in prices of clothing in any of the present price ranges as well as new price lines," the introduction of two-trouser suits which must be sold as one unit constitutes introduction of "new price line," which warrants establishment of new commission rate. The company contended that the union's claim for higher commission on existing price ranges is not consistent with the company's pay policy. The company denied that the current labor contract provided for an increase in the commissions on existing price lines in the event of a rise in retail prices, and stated that even if the contract provision pointed to is capable of such construction, it should nevertheless not be given effect, because it was inserted in the contract without the knowledge of the company, and was carelessly overlooked by it when the contract was signed. The arbitrator pointed out that by the words of the contract provision, which expressly refer to "a rise in prices of clothing in any of the present price ranges as well as new price lines," the parties intended that the matter of increased commissions would at least be discussed. Under the circumstances, the arbitrator has no right to ignore the express language of a contract provision or to hold any portion of it meaningless. (In re arbitration between Bond Clothes, Inc., and United, Retail, Wholesale & Department Store Employees)

*** ESTABLISHED CUSTOMS PART OF CONTRACT**

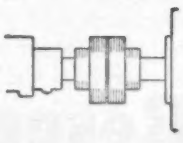
Established customs are, in effect, part of the contract. An employer who for many years granted assistant foremen two weeks' vacation salary (the same as was granted to other salaried employees) and who continued such practice for three years after the foremen began also to receive vacation benefits under union contract, may not discontinue such vacation salary after he began to pay assistant foremen for overtime work. The 2-week vacation salary was part of the working conditions under which the three assistant foremen were employed, and that allowance was recognized as an established plant practice and custom. The practice was not changed by the terms of the labor contract in 1945, and its continuation was not in violation of any of these provisions. The company's right to change the practice was predicated upon its giving notice to the three assistant foremen prior to the effective date of the 1945 contract. In the absence of notice, the contract must be construed as continuing in force the same vacation arrangements as had formerly existed. (In re arbitration between Franklin Assoc. of Chicago and International Typographical Union, Local 16)

*** UNILATERAL ESTABLISHMENT OF RETIREMENT PLAN**

An employer may unilaterally establish a retirement plan and enforce the policy

AJAX

FLEXIBLE COUPLINGS



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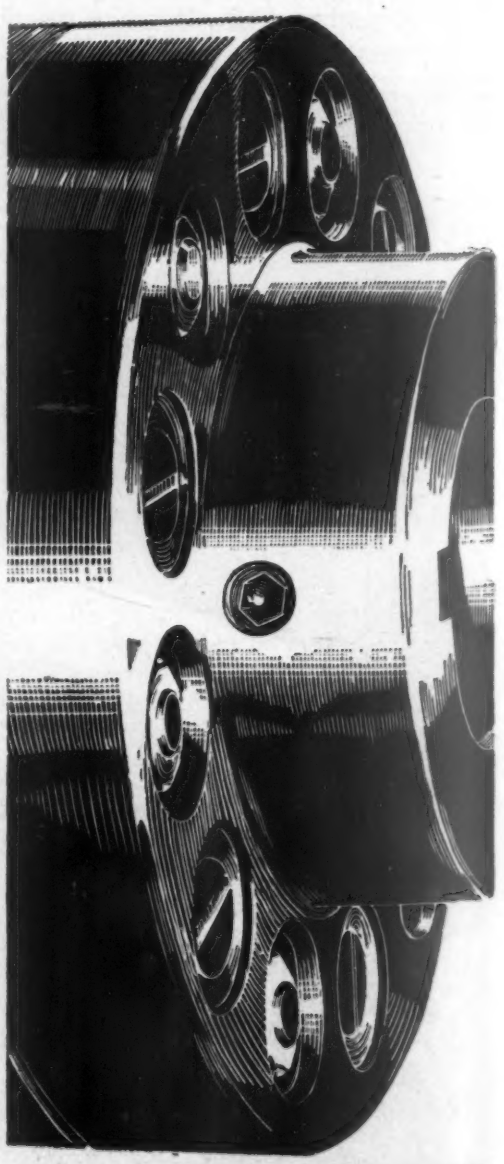

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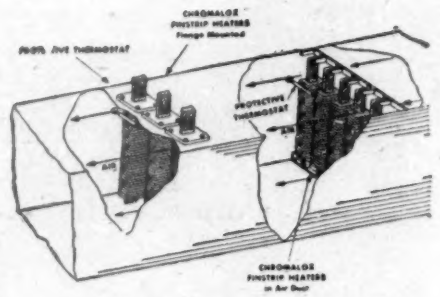

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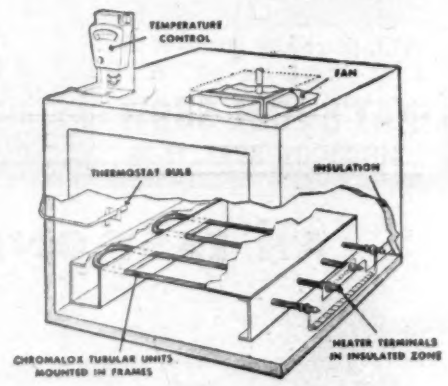
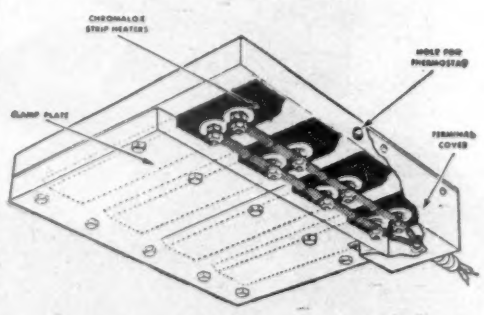


AIR-DRAW OVEN USING TUBULAR HEATERS

For heat-treating small parts, tools, dies, etc. Adapted to small quantity production where temperatures up to 1000° F. and accurate controls are required.



PLATEN USING STRIP HEATERS

For heating platens in laminating, molding and curing presses. Strip Heaters are also used for heating dies, rolls, moving parts, tanks and many other applications.

For more Application Ideas—get the booklet

"100 WAYS TO APPLY ELECTRIC HEAT"

It contains a wealth of application data and diagrams, together with the address of the Chromalox Application Engineer serving you.

STRIP HEATERS • CARTRIDGE HEATERS • IMMERSION HEATERS • FIN-STRIP HEATERS • TUBULAR HEATERS • RING HEATERS

Removes 2 TONS of incrusted dirt in less than 8 HOURS!

AN EASY ONE MAN JOB WITH THE

TENNANT INDUSTRIAL FLOOR MACHINE

Pulverizing and shearing thick hard grime from floors at the amazing rate of 8 to 20 lbs. per *minute*, the Tennant Industrial Floor Machine makes a fast, easy job of *any* floor-cleaning assignment, no matter how tough!

Removes hardened tar, grease, dried paint, cement splashes and similar material like magic.

Guaranteed to do the job!

The way to finer floors
TENNANT
Floor Maintenance System

REVO-tool pulverizes and removes thick incrusted grime. Provides over half million impacts per min.

FEATURES

- **REQUIRES ONLY 1 MAN**
- **PICKS UP SOILAGE** as it goes. Eliminates extra sweeping.
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- **ELIMINATES CHEMICALS** or need for soap and water.
- **NO INTERFERENCE** with normal plant operations.

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WRITE TODAY for proof of what the Tennant Industrial Floor Machine can do for you. Full-length news story, photos, authentic shop reports, maintenance data—all mailed to you promptly. No obligation.

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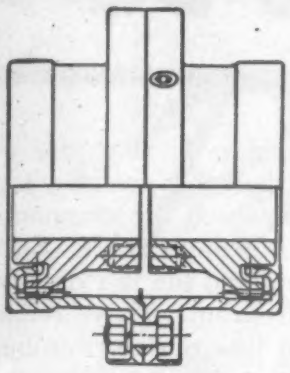
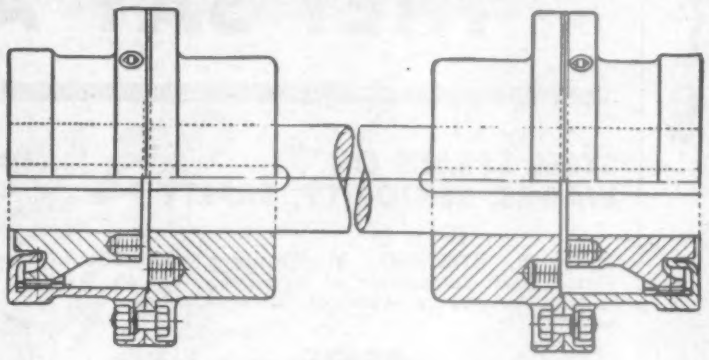
of compulsory retirement at the age of 65, provided he applies the policy both to union and to non-union employees within the bargaining unit. Under a clause prohibiting an employer from using his prerogatives "for purpose of discriminating against any member of the union," he may not apply the policy of compulsory retirement at the age 65 to employees who are union members if he does not also apply it to non-union employees within the bargaining unit, since such disparity of treatment would be discriminatory and disadvantageous to the union. A bargaining agent cannot agree that a given company policy subject of general application to all employees in a bargaining unit, may be made applicable to certain employees in the unit and inapplicable to others. Management, having a right under the collective bargaining agreement to establish a policy of compulsory retirement of employees, a universal enforcement of such policy does not violate the seniority provision of the agreement. (In re arbitration between General American Transportation Corporation and United Steelworkers of America)

*** INSTITUTION OF PENSION PLAN BY UNION ALLOWED**

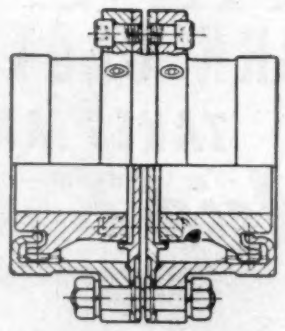
The institution of a pension is a matter which may be imposed upon a company by an arbitrator, since a pension plan is properly the subject of collective bargaining. The company contended that "the institution of a pension involves so many different and varied factors that it is essentially a matter that never should be imposed upon the company." It went on to say that the board of directors had decided that no pension plan be adopted, and made a series of points in relation to its ability to pay and the financial burden of a pension plan. As a basis for his award, the arbitrator pointed out that the record of this case, as well as general knowledge, reveals many instances in which the issue of pension has been and is, in fact, the subject of collective bargaining. The record shows that pension plans were established by other transit companies in New York City. The data on the extent of pension plans in the transit industry in three boroughs in New York City, and on the practice in other large cities, established a strong case for a pension plan. Pension plans have become a prevailing practice in private companies in the transit industry in New York City. The company's financial condition was not such as to preclude assumption of costs of such a plan for a period of current contract, at the end of which the parties will be free to negotiate in the light of all circumstance then prevailing. The arbitrator's award for the establishment of a pension imposed no obligations on the company to be assumed after the contract expires. As with any other provision of a contract, changes may be made by agreement when a new contract is negotiated. (In re arbitration between New York City Omnibus Corporation and Transport Workers Union of America)



STANDARD



FLOATING SHAFT



BREAKING PIN

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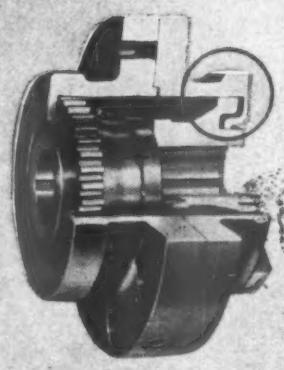

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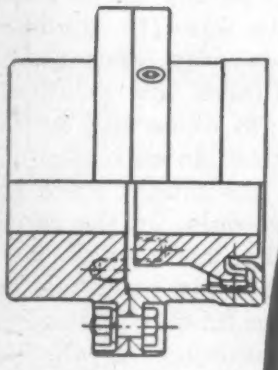
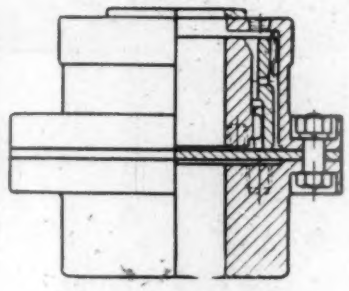
K KOPPERS

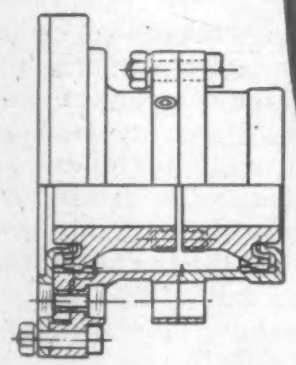
FAST'S *self-aligning* COUPLINGS



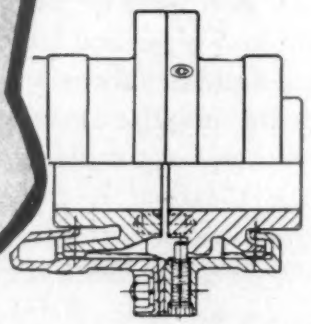
SINGLE ENGAGEMENT



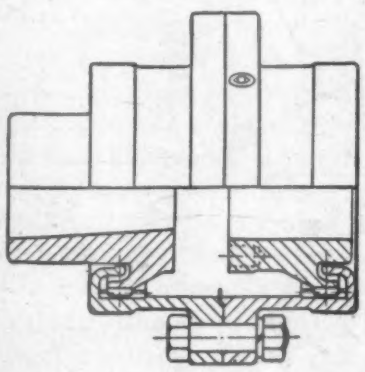
VERTICAL



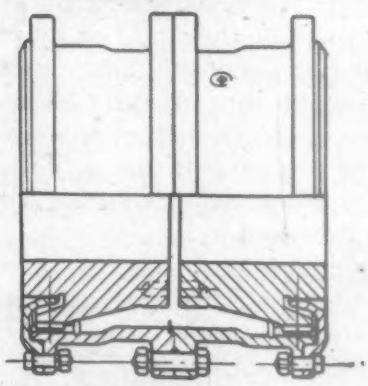
SHEAR PIN



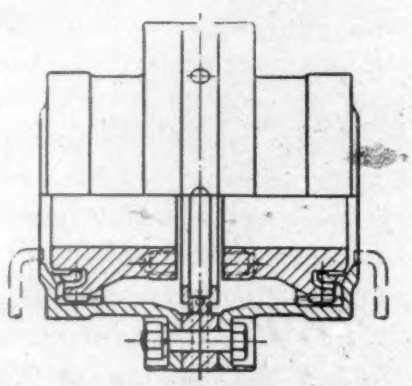
CUT-OUT



MILL MOTOR

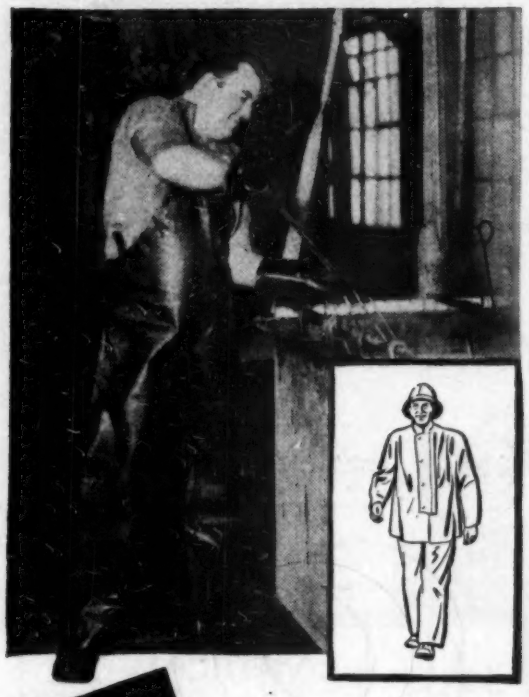


HEAVY DUTY



CONTINUOUS LUBRICATING

RAINFAIR
WORK CLOTHING
TAKES AN *Acid Bath!*



Scene in pickling room of Borg-Warner Corp., Rockford Clutch Div., Rockford, Ill. showing use of Rainfair high-bibbed pants. Inset: Rainfair Utility Suit.

● An acid bath is "duck soup" for Rainfair-Vulcanized Utility Suits because Rainfair fabrics are engineered to withstand the severest "wet-job" conditions imaginable. Since Rainfair Work Clothing is rugged, longer-lasting, wearers get a full measure of protection, plus extra service, resulting from these Rainfair quality features: (1) Vulcanized (2) Seams cemented and reinforced (3) Points of strain riveted (4) Buna-S coated fabrics are 100% waterproof, resistant to wear and deterioration. Whether your application requires protection against acids, oils, alkalies or water, you can do it better with Rainfair-Vulcanized clothing. Write for catalog on raincoats, hats, rainsuits, acid suits, aprons and the name of your nearest distributor.

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WATERPROOF WORK CLOTHING

THEY SAY AND DO

STEEL SPEAKS ON WAGES, SENIORITY, SAFETY

JOHN A. STEPHENS, Vice-President, United States Steel Corporation of Delaware, from an address before the American Management Association

For years we have been recording grievances filed by employees. We found that approximately 70 per cent of the grievances alleged wage rate inequities. The prior steel agreements did not specify any wage scales. There were thousands of separate jobs and, while each job did not carry an individual rate, there were, nevertheless, thousands of rates. The first agreements provided that where alleged inequalities in wage rates prevailed the matter could be taken up for local plant adjustment and settlement made on a mutually satisfactory basis. Not much time passed before allegations of individual rate inequalities became the order of the day.

From individuals it spread to groups, and that day could be counted lost whose low, descending sun had not seen a sizable batch of grievances started through the grievance procedure. Nor could the union and the companies agree on standards by which to judge whether a specific rate was improper. Settlements made became the springboard from which other individuals could claim inequities in the rates applicable to them. Each grievance denied, fed the fires of individual discontent. Obviously, of course, one concerned with developing better industrial relationships need look no farther for a starting point. . . .

Today our labor agreements contain a "rates of pay" section which, among other provisions, sets forth that the hourly wage rate established for each classification is recognized as the rate of a fair day's pay on the job and that "No basis shall exist for an employee, whether paid on an incentive or non-incentive basis, to allege that a wage rate inequity exists and no grievance in behalf of an employee alleging a wage rate inequity shall be filed or processed during the term of this agreement."

This inequity job is by no means finished. To date four agreements, separate and apart from the basic labor contract, have been executed. . . .

In the first agreement, October 23, 1945, the parties agreed that "The fundamental principle of the wage relationship is that the employee is entitled to a fair day's pay in return for which the company is entitled to a fair day's work." So far, we have completed the fair day's pay part of the program. There remains the important task of determining on each job what constitutes a "fair day's work." . . .

Seniority has been a fruitful source of trouble. Agreements dealing with basic matters in six companies cannot go into specific detail in the application of seniority at any given plant. Our agreements specify qualified seniority—that is, only when ability and physical fitness are relatively equal shall length of service be the determining factor. In each negotiation the union has sought more reliance on service only. In the recent negotiations, the companies were confronted with many proposals intended to restrict further managerial discretion in promotions, layoffs, rehirings, and the like. . . .

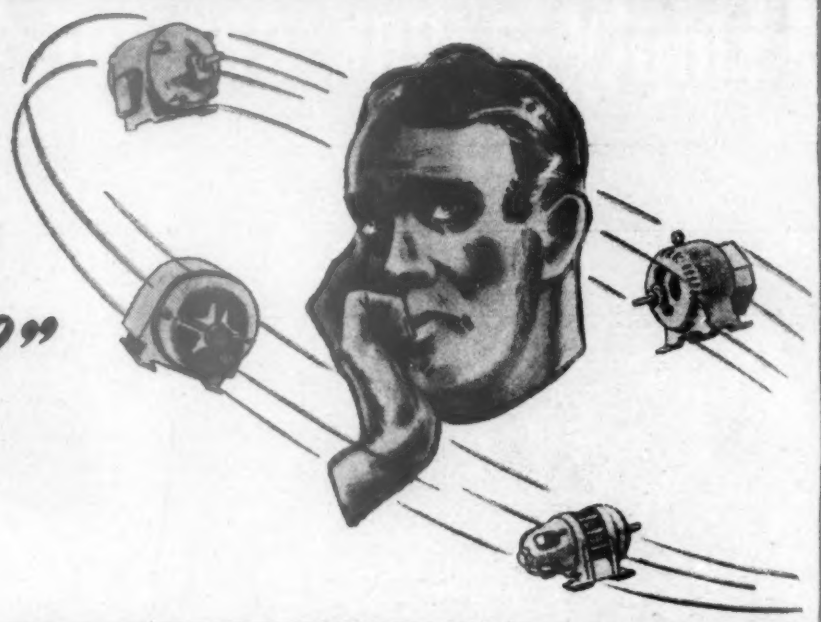
Accordingly, we proposed that a committee review the practices developed in the plants under prior agreements and recommended, and I quote, "those practices best calculated to assure to the companies qualified employees in each job in the interests of low-cost operations and to assure to the employees the greatest degree of security in their jobs and opportunity for advancement, increasing with length of service as is consistent with the governing objective of the parties, which is low-cost, safe, and efficient operations and cooperative employer-employee relationships." . . .

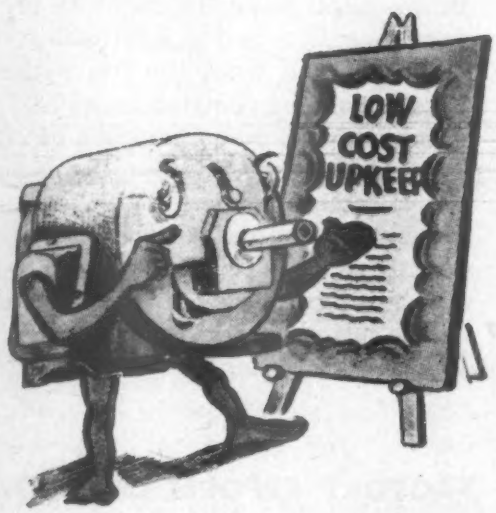
Conditions of Safety

Over the years we have had some unauthorized strikes growing out of employee contentions that they were being required to work under conditions which were unsafe. But, as a matter of fact, there are only three industries whose record on the avoidance of accidents surpasses the steel industry's. When such difficulties were encountered, supervision felt that employees were using the safety angle as a cloak for other matters which they did not like, such as necessary changes in incentive rates.

In any event, we were faced with the necessity to compose an insistent union proposal that men not be required to work under conditions which they claimed were unsafe. Should the union not be on the level

"Puzzled over which type of motor to buy?"





In 80% of the Cases, open squirrel-cage induction motors meet the need. They fit most drives, and can be obtained in numerous standard and special designs to meet varying conditions of starting torque, slip, etc. They are also the most economical type to buy and to maintain. Allis-Chalmers builds induction motors in sizes from ½ to 10,000 hp — or higher, if needed.

For Tough Starting Conditions, wound-rotor induction motors are recommended. Their high starting torque, at comparatively low starting current, and their controllable speed characteristics are desirable in drives for conveyors, grinding mills and other tough starting assignments. Compact, accessible Allis-Chalmers wound rotor induction motors range in size from 5 to 10,000 hp.

For Slow Speed, direct-connected drives as low as 75 rpm, or other constant speed applications at higher rpm, synchronous motors are a good solution. They are of particular benefit when a system's power factor is low, since they can be furnished for operation at either unity or leading power factor. From 40 hp to 50,000 hp and higher — in bracket bearing, pedestal bearing, or engine types.

Is d-c Available? Then adjustable speed operation is easily obtainable. Allis-Chalmers builds d-c motors from ½ to 10,000 hp and higher — for constant or adjustable speed duty in ranges of 6:1 and lower. By means of a source of d-c voltage, adjustable speed motors may also be designed to operate over a speed range as high as 30:1. Suitable for fans, elevators, etc.

Select from the Complete Allis-Chalmers Line!

NOT JUST FOLLOWING popular choice and using a standard squirrel cage induction motor. But the *right* motor for economy and efficiency.

That means an overall knowledge of *all* types of motors . . . their operation . . . limitations . . . maintenance. And there's where your A-C representative can be a big help. His recommendations are backed by experience . . . and the Allis-Chalmers motor he selects is *itself* backed by 50 years of experience in motor design and building. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2304

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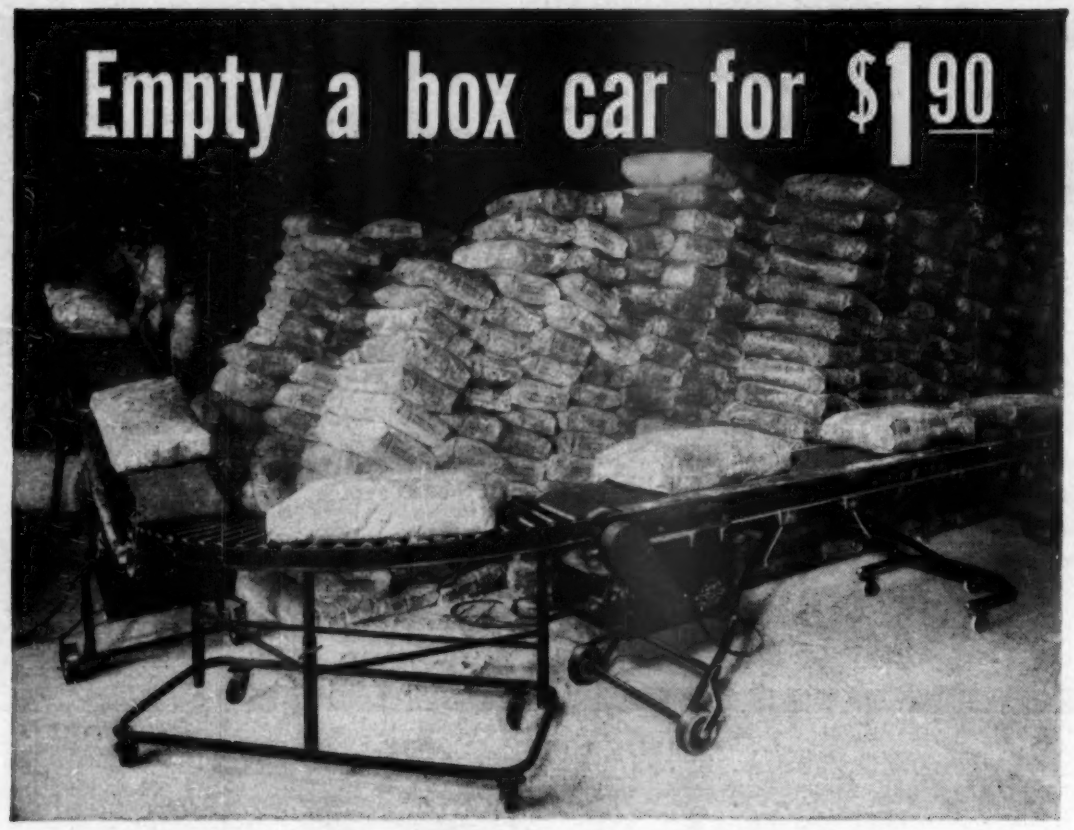

former cost $17.10

DIRECT SAVING $15.20

When bagged cement and aggregates were handled by hand truck from box car to warehouse, it required six men working for at least three hours to empty the car and stack the bags. Now, since Rapids-Standard Stevedore, Jrs. have been installed, four men empty a car and stack the bags in half an hour. At 95c per hour this means a direct saving of $15.20 on every car unloaded. And, there are indirect savings in less wear and tear on floors and smaller demurrage charges since freight cars are not held for as long.

H. H. Dickenson Company of Detroit, who operate this system, also use it for handling metal lath, 50 and 100 pound chimed cans of plastics and roofing cement and the many other articles handled by a large building supply house. This equipment paid for itself in direct savings very soon after it was installed and continues to deliver comparable savings every day that it is used.

Rapids - Standard Stevedore, Jrs., Rapid Power Boosters, Rapid - Wheel and Rapid-Roller Gravity Conveyors and Floor-Veyors will save time and money in handling cartons, kegs, cases, bales, cans or packages. Write today for full information on how they can save time and money for you.

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Manufacturers of
STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division—370 Peoples National Bank Bldg., Grand Rapids 2, Mich.

in this connection, the companies could, by acceding to the proposal, have opened the door for the legitimization of strikes otherwise prohibited by the agreements by the simple but, of course, improper expedient of alleging in each circumstance an unsafe condition. We, however, decided we had better test the sincerity of the proponents of the proposal.

Our decision in this connection was based to a great degree on the assumption that when men understand that they are not being forced under threat of discipline to do certain things, better relations and performance will follow. Accordingly, the agreements provide that employees who believe they are being required to work under unsafe conditions shall have the right to file a grievance for speedy arbitration, or to be relieved from the job without loss of right of reinstatement and to be assigned at management's discretion to such other employment as may be available; provided, however, that no employee under such circumstances shall take any steps to prevent another employee from working on the job beyond communicating to him the alleged facts.

FACTORY REFORM IN INDIA

McGRAW-HILL WORLD NEWS, New Delhi, India

Measures to bring up the working conditions of factory labor in India to the standards prevailing in the leading industrial countries of the world are being taken by a special organization set up by the government of India under the Chief Adviser, Factories.

These measures are of a threefold character. They consist in the first place in the advice given by the organization to the central government, provincial governments, states, and employers on conditions necessary to insure the safety and health of the workers. Second, the organization acts as a vigorous propaganda center radiating among the employers and workers a sense of compliance with the factory laws. Last, it organizes training courses for factory inspectors, especially the new recruits, and functions, besides, as a center of technical information and advice and as an avenue of discussion among the factory inspectors of the country.

The organization is intended to function in an advisory capacity only and is being equipped to help the provinces and states somewhat on the

lines of the federal organization in America, which gives assistance to the labor departments of the various states.

The advice which the organization tenders to governments and employers is reflected in the provisions of the new factory legislation prepared by the organization for consideration by the central legislature during its next session.

STUDY SEES MOVE TOWARD STANDARDIZATION

Higher production costs and prospects of a shift from a sellers' to a buyers' market are causing management to consider industrial standardization as a means for turning out a quality product at the lowest price compatible with satisfactory performance, according to a survey just completed by the National Industrial Conference Board.

Renewed interest in industrial standardization, the study points out, can be traced in part to industry's experiences in war production, which required general use of "the best techniques, methods, and materials; simplification of design to reduce the number of parts, models, and varieties; and maximum interchangeability."

The Conference Board survey, however, stresses the peacetime potentialities of this management "tool." It points out that industrial standards can promote general usage of the best methods, materials, processes or products. Also, concentration of productive effort on a simplified line of standard products "permits management to realize the economies of repetitive mass production." The study mentions additional benefits such as "better and quicker servicing of customers, smaller inventory requirements from manufacturer to retailer, and closer coordination among the purchasing, engineering, manufacturing, and sales departments of the company through joint consideration of standardization proposals affecting all groups."

LABOR-MANAGEMENT TEAMWORK

Making organized labor a direct part of production and cost planning is an innovation in labor-management teamwork currently being tested by Oliver Iron & Steel Corporation, Pittsburgh.

This teamwork is accomplished by

Cut Operating Costs...

WITH THE WORLD'S NEWEST, LOW-COST INTERCOM SYSTEM!

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A free demonstration will prove that DICTOGRAPH will cut your operating costs from the moment it's installed! It helps everyone do more in less time . . . keeps executives in immediate touch with every staff member . . . makes every minute more productive. It's your answer to your #1 problem today—how to cut operating costs—and you'll realize it immediately as soon as you see DICTOGRAPH in action! Send the coupon today.

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Investigate the use of conveyors. Conveyors handle a wide variety of parts, packages, units, cans, bottles, barrels, bundles, drums and boxes. Available in light, medium or heavy-duty types — portable or stationary — as systems, sections or units — power or gravity fed, they give you remarkable savings in time, money and manpower conservation. They relieve confusion and congestion.

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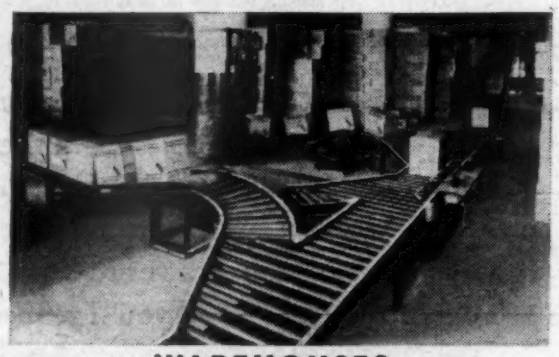
Write today for catalog No. FM-947 "Conveyors by Standard" — a ready reference on conveyor types and systems.

PRODUCTION LINES
No congestion — order and cleanliness when production moves on conveyors.



WAREHOUSES
Merchandise flows in and out of storage with order and system on conveyors.

LOADING DOCKS
Load or unload shipments in half the time with conveyors.

STANDARD CONVEYOR CO.
General Offices: North St. Paul 9, Minn.
Sales and Service in Principal Cities

ROLLER - BELT - SLAT - PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

a time study and methods department composed by both labor and management representatives who make studies and develop recommendations jointly. An educational program also is being presented to shop foremen, assistant foremen, shop stewards, and other union representatives, which enables them to take an active part in the time study and methods engineering work regularly conducted by the company.

A continuation of the educational program, which was started last June, was presented recently in a 2-hour time study and methods motion picture shown in the plant offices. This was a series of reels prepared by Ralph M. Barnes, professor of industrial engineering at the University of Iowa.

The Oliver time study and methods department has been organized so that its personnel is balanced with union representatives who regularly work as a part of the department.

In this way equally balanced labor-management time study and methods teams have been formed to make joint analyses of job requirements and other production factors. Thus job timing, mechanical improvements, operation costs, and related problems can be studied jointly and recommendations made which are mutually satisfactory to labor and management.

This is believed to be one of the first instances where this form of collective bargaining—by joint, unbiased study—has been carried directly to the workers by a plan that actually makes organized labor a part of management planning. The initial program originated with the company in 1940 and has since progressed to its present high level of efficiency. Still more complete application of the principles will continue to be developed, and it is planned that the educational part of the program will be offered to the entire union membership through special programs at the union halls.

IT'S THE CUSTOMER THAT SETS THE PRICES

ERNEST R. BREECH, Executive Vice-President, Ford Motor Company, speaking to American Marketing Association

In the current situation, the goal of high volume and lowered prices is almost academic in view of material shortages and rising costs. But admitting our immediate difficulties, we still have the task of arriving at a long-range (pricing) policy, one

WE TORTURE OUR CASTINGS

—to learn how to make them stronger for you

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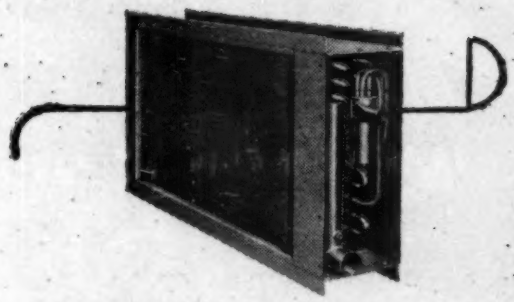
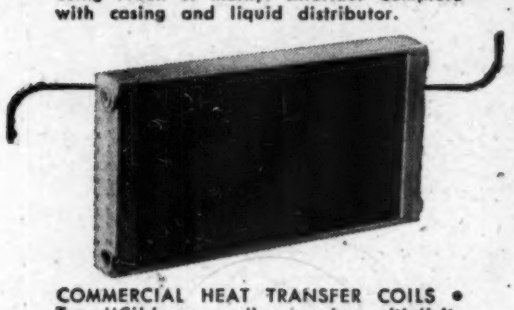
YOUNG

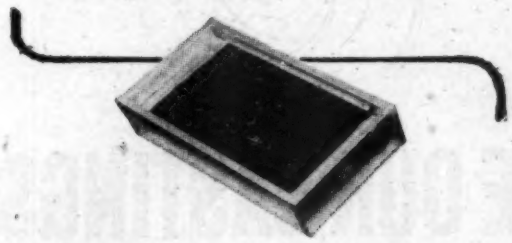
HEATING-COOLING COILS
AND AIR CONDITIONING UNITS



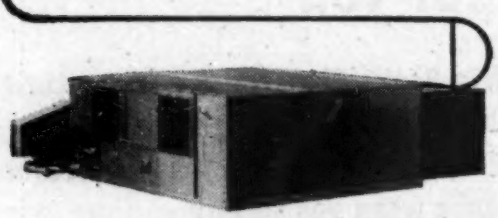
EVAPORATOR COILS • Illustrated is Type "E," for direct expansion cooling systems using Freon or methyl chloride. Complete with casing and liquid distributor.



COMMERCIAL HEAT TRANSFER COILS • Type "C" (unencased) comes in multiplicity of sizes for factory-built air conditioning, heating, drying or special processing units.



BLAST COILS • Type "B" shown here, is for use in central plant heating, ventilating and air conditioning systems. Has casing for bolting to sheet metal housings.



STREAMAIRE AIR CONDITIONING UNITS • For heating, cooling, humidifying, dehumidifying, filtering in any combination. Mail coupon below for further details

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which attempts to give the proper balance to all the complex elements involved in arriving at a sound price structure.

We at Ford Motor Company have so far been unable to establish a precise mathematical rule for pricing, I am sorry to say. The best substitute we have found to date starts with a broad system of forecasting, and right in the middle of all our forecasts there stands one dominant figure—our customer. All the money we are ever going to get, we are going to get from him. And so we know that ultimately he sets our price, and that we are going to have to live and operate inside the limits he fixes. . . .

However you might define the American pricing system, it is not a lazy man's system. For the American consumer is a hard taskmaster. Trying to find out just what people want, estimating what they may be able to pay at any given time to satisfy those needs and desires; designing, manufacturing, and delivering to millions of people scattered all over the map; persuading them to buy when you are ready to sell—this whole formula is always a great and thrilling contest, full of risks and rewarding satisfactions. It is a system which has helped to build a great nation a vigorous, skillful, independent people, and it brings out the best in man.

CENTRALIZED PLANNING AIDS OPERATION

HAL E. NOURSE, Vice-President, United Air Lines, Inc., Chicago, addressing the Conference on General Management Problems of the American Management Association

My purpose is to develop in full outline form a new concept for management, accomplished through the means of a centralized economic and business planning group, equipped with "teeth" for follow-through purposes, known as the Economic Controls Administration.

This planning concept segregates a number of the "common-to-all functions" and sets them up in one place under one head to provide a plan and a service to all segments of organization. It contemplates no operating functions in the field—activities are restricted simply to planning with technical or functional control; the administration and implementation of the plan remain with the line organization.

In those fields of activity where a great deal of study and research are required to formulate plans and policies, permanent part-time or even full-time help is assigned from the

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EMPLOYEE MORALE!

Just one of the many reasons why you need good food service facilities in your plant.

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. . . serves more workers faster, more efficiently, with less help . . . just one of the many reasons why you find PIX installations in hundreds of progressive plants. Let PIX Engineers explain.

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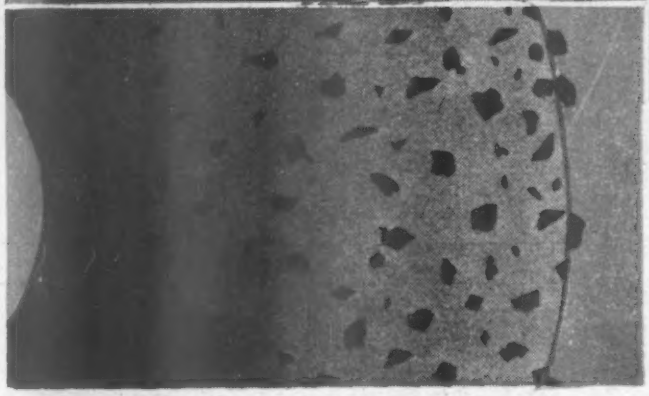
YOU COLLECT DOUBLE

with MICRO-KLEAN Fluid Cleaning

Here's the micronic filter with the exclusive cartridge construction that saves 50% in cartridge replacement costs . . . because it collects double the quantity of solids before clogging.

A FILTER SIZE FOR EVERY JOB!

Connections from ⅜" IPS to 6" flanges—capacities from a few gallons per hour to 850 GPM or more — single or multiple cartridge units. Your smallest or your largest filtration problem can now be handled with a single compact unit sized to the job requirements! Constructions in die-cast aluminum, cast iron, welded steel, stainless steel, or bronze make these filters adaptable to a wide range of fluids and operating conditions. For specific examples of typical services — and models used — see below.



1. **Graded Density in Depth** — a newly developed method of "felting" creates a structure in which spaces between fibres become progressively smaller and more numerous approaching discharge surface. Smaller particles penetrate to varying depths — no surface sealing.

2. **Controlled Fibre Distribution** — gives consistent, uniform, filtration characteristics.

3. **Resinous-Impregnated and Polymerized** — each fibre bonded in position to give structural strength. No channeling, rupturing, shrinking or distortion.

4. **85 to 90% Porosity** — no structural components to waste space. RESULT: higher flow rates, greater dirt capacity, longer cartridge life.

Cuno Micro-Klean cartridges fit other makes of filters — increase efficiency.

1. Model 1B1-2230: Adopted by leading machine tool manufacturer as standard equipment on grinding machine lube oil system. 250 # operating pressure.

2. Model 1C1-2230: Widely used on domestic oil burners.

3. Model 1B1G-2239: Air line filter as used by automobile manufacturer on plant air service.

4. Model 3A1-2278: For chemical manufacturer to filter light mineral oil solution of DDT.

5. Model 3A2-2278: All bronze model purchased by chemical manufacturer for process water in manufacture of stearates.

6. Model 3A2-2278: For manufacturer of electric motors to filter lubricating oil on test stands.

7. Model 30D2-2278: For manufacturer of transformers to handle petroleum solvent used in final cleanup and hydrostatic test of transformer housings.

Other Filters May Appear to Be Built This Way . . . But Only the Cuno MICRO-KLEAN Has All 4 Reasons for Double Life

For new bulletin on MICRO-KLEAN Filters, or to have Cuno representative discuss with you some specific fluid-cleaning problems, write (on your business letterhead) to Cuno Engineering Corporation, 612 South Vine St., Meriden, Connecticut.

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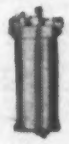
Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

AUTO-KLEAN
General service down to .0035". Disc-type. Continuously cleanable.

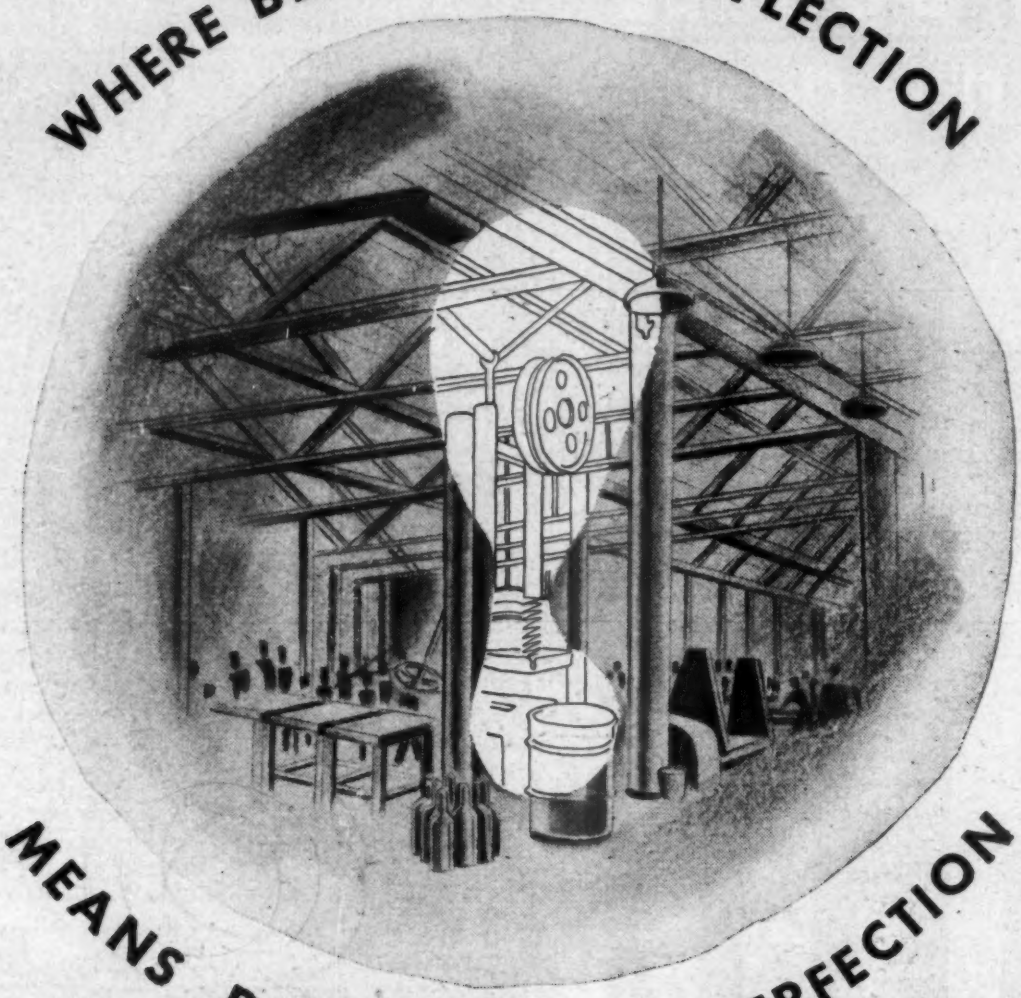
FLO-KLEAN
For highly abrasive solids down to .0025". Wire-Wound. Continuously cleanable.



MICRO-KLEAN
Micronic-type. Molded Fibre. "Graded Density in Depth" cuts replacement costs.

COOLANT-KLEAN
Low-cost unit filtration of grinder coolant. Fabric-type element.

WHERE BETTER LIGHT REFLECTION



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with VALDURA PAINTS THAT ENDURE MILL WHITE

The Whitest of White Paints

VALDURA Mill White Paints have an unsurpassed light reflection value of 92.3%—eliminating employee fatigue and increasing production efficiency through reduced errors. Mill White effects further savings through lowered illumination costs and long lasting service that means real maintenance economy. Combining extreme durability with sparkling, non-yellowing whiteness, these whitest of white paints were especially developed for dairies, laundries, and the like; but they are widely used in every industry where economy is of major importance. From four finishes, choose the Mill White especially formulated for your needs. For Perfection in Reflection, better light and better sight, ask for the white paint that stays white, VALDURA Mill White. See your Valdura Dealer.

AMERICAN-MARIETTA COMPANY, 43 E. Ohio St., Chicago II, Ill.

A GREAT NAME IN PAINT MAKING

line organizations to assist the centralized group. This is particularly true in such areas as job analysis and evaluation, standards setting, methods work, and airplane schedule planning. These assigned experts then, after the plan evolved is adopted, remain with the line organization for implementation and follow-through purposes. They become the central planning group's men in the field for further advances in use of the techniques established.

Six divisions are included in this administration—economic research, airplane schedules, cost control, organization control, regulations, and work analysis. A vice-president has administrative jurisdiction over the heads of the divisions, and is directly responsible to the office of the president for their activities as well as for special assignments given him by the president.

Economic Research, supervised by a manager of economic research, has the responsibility of performing all economic and market research necessary to sound planning. This group initiates and analyzes proposed extensions and works directly with general counsel in the preparation of applications filed with the Civil Aeronautics Board for new routes and amendments to existing routes.

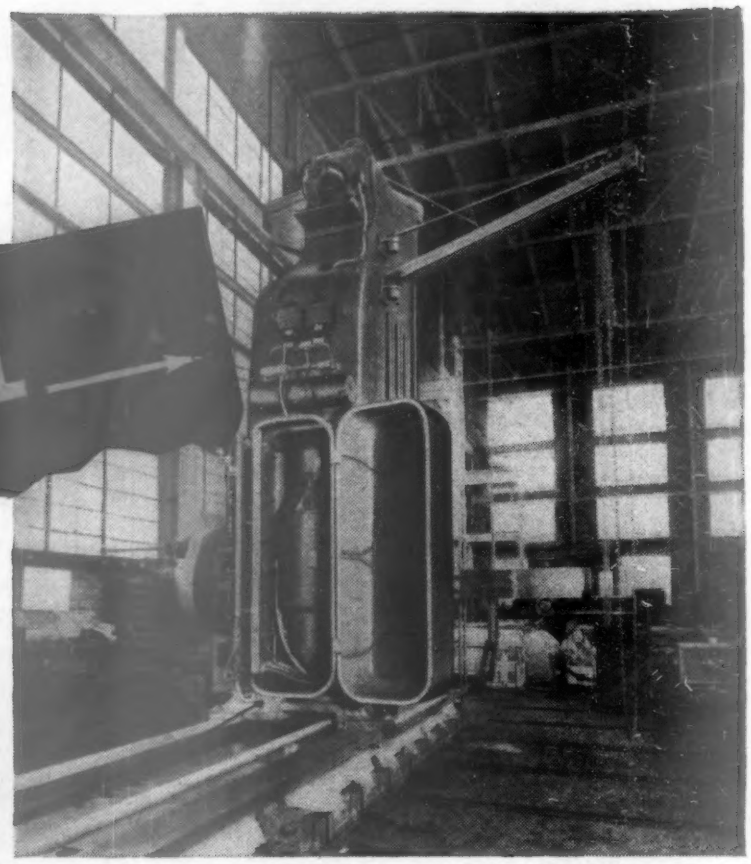
This division also conducts special studies and prepares reports on all phases of air transportation research which may be required by the president and other administrations and departments.

Airplane Schedules Division is operated under a superintendent of airplane schedules, who is responsible for the coordination of all information and opinion respecting the establishment of flight schedules. The division also is responsible for allocating available weight and space between cargo business and passenger business, and for determining the type of equipment to be used on various schedules.

Cost Control, headed by a superintendent of cost control, is concerned with the establishment of departmental expense budgets and the proper allocation of available funds between the various parts of our company. This responsibility includes short-range financial forecasts, cost control studies, cost analyses of leases and contracts, coordination of departmental capital expenditure, personnel and operating expense budgets, and

SPEED BOOSTS PRODUCTION . . .

control it ACCURATELY over WIDER RANGES . .



Traveling head horizontal boring, drilling and shaping machine with Rototrol counter emf speed regulators providing accurate speed control over a 12 to 1 speed range in the main drive and 100 to 1 on the feed drive. No gears, clutches or mechanical speed changers are used in obtaining this range of speed.

Here's real help in meeting today's demand for more production . . . an improved product . . . at lower cost. It's the Westinghouse ROTOTROL—an ingenious control for all types of regulating problems.

One of its functions is Speed Regulation, involving accurate control of motor speeds over wide ranges . . . matching the speed of one drive with another or holding speed constant regardless of load variations.

Swift recognition of the advantages of this type of control has led to numerous applications on machine tool feed drives, skip hoist, planer, elevator, winding and supercalender drives. As a result, the productivity of this equipment has been increased . . . its maintenance reduced . . . its elements simplified.

And Speed Regulation is only one of many Rototrol functions that will help you turn problems into profit. Others have found extensive application and many are yet to come.

For further details, ask for B-3649. Call your local Westinghouse office or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

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Westinghouse

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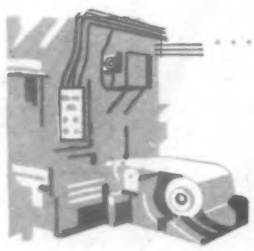
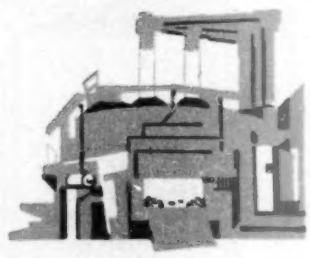
ROTOTROL

ROTOTROL IS ALSO BEING USED SUCCESSFULLY ON A WIDE VARIETY OF EQUIPMENT TO AUTOMATICALLY . . .



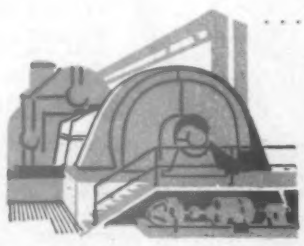
. . . MAINTAIN CONSTANT TENSION

or constant torque on roll, reel, draw and similar applications. Reduces strip breakage, produces a uniform coil—boosts production.



. . . CONTROL POWER INPUT

to Electric Arc Furnaces by accurate electrode positioning; increases production, reduces power consumption and maintenance.



. . . CONTROL STABILITY

or pull-out torque control on piercing mills, chippers and electrical ship propulsion drives. Permits increase in short-time motor rating . . . reduction of size and cost of drive equipment.

. . . and other profit-building functions are covered in this new, 36-page book. Send for it today.

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THAT SAVE TIME, WORK, MONEY WITH PERMACEL SELF-STICKING TAPES!

DISPLAY CASE MANUFACTURERS CUSHION AND HOLD THE EDGES OF GLASS USED IN SHOWCASES WITH **PERMACEL-50** BEFORE INSERTING IT IN THE GUIDE CHANNELS.

A BABY-CARRIAGE MAKER NOW USES **PERMACEL-77** INSTEAD OF KRAFT TAPE FOR HOLDING A FIBER STRIP (TO WHICH HOOD LINING IS TACKED) TO THE METAL FRAME OF THE CARRIAGE HOOD. **PERMACEL** DOES IT BETTER, QUICKER, AND IS MORE PERMANENT.

PACKERS OF TURKEYS AND OTHER FOWL WRAP THEM IN CELLOPHANE AND SEAL THEM WITH **PERMACEL'S** COMPANION, **TEXCEL TAPE,** MAKING A NEAT, ATTRACTIVE, EASILY HANDLED PACKAGE.

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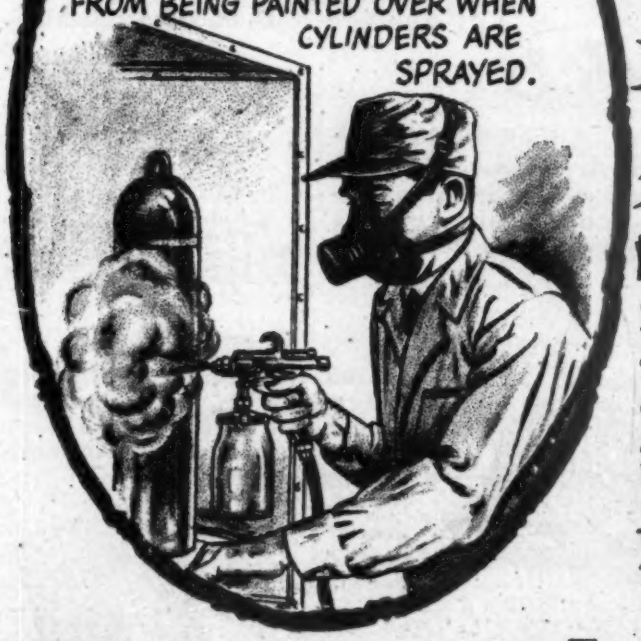

FREE IDEA BOOK! COMPLETE GUIDE TO THE MANY TYPES AND USES OF **PERMACEL TAPES**—FULL OF NEW IDEAS, SUGGESTIONS THAT MAY SAVE TIME AND MONEY IN YOUR BUSINESS! WRITE FOR "FACT BOOK ON PRESSURE-SENSITIVE ADHESIVE TAPES" TO DEPT. FM-9, INDUSTRIAL TAPE CORP., NEW BRUNSWICK, N.J.

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the formulation of recommendations to the budget committee.

All purchase requisitions and work orders covering capital expenditures and also requisitions for personnel are approved by cost control.

Organization Control Division, under a superintendent of organization control, is concerned with comprehensive organization planning and the establishment of a sound organization structure that will facilitate the effective management and operation of the company. Through the use of organization charts and text material this division defines the functions and responsibilities of organization elements, limits of authority, correct titles, and the relationships between various parts of the company.

The division is responsible for the closely related work of job analysis and the writing of job specifications. Job analysis, which is done in cooperation with the administrations and departments concerned, includes the compilation, analysis, and preparation of all information necessary to determine the characteristics of each job.

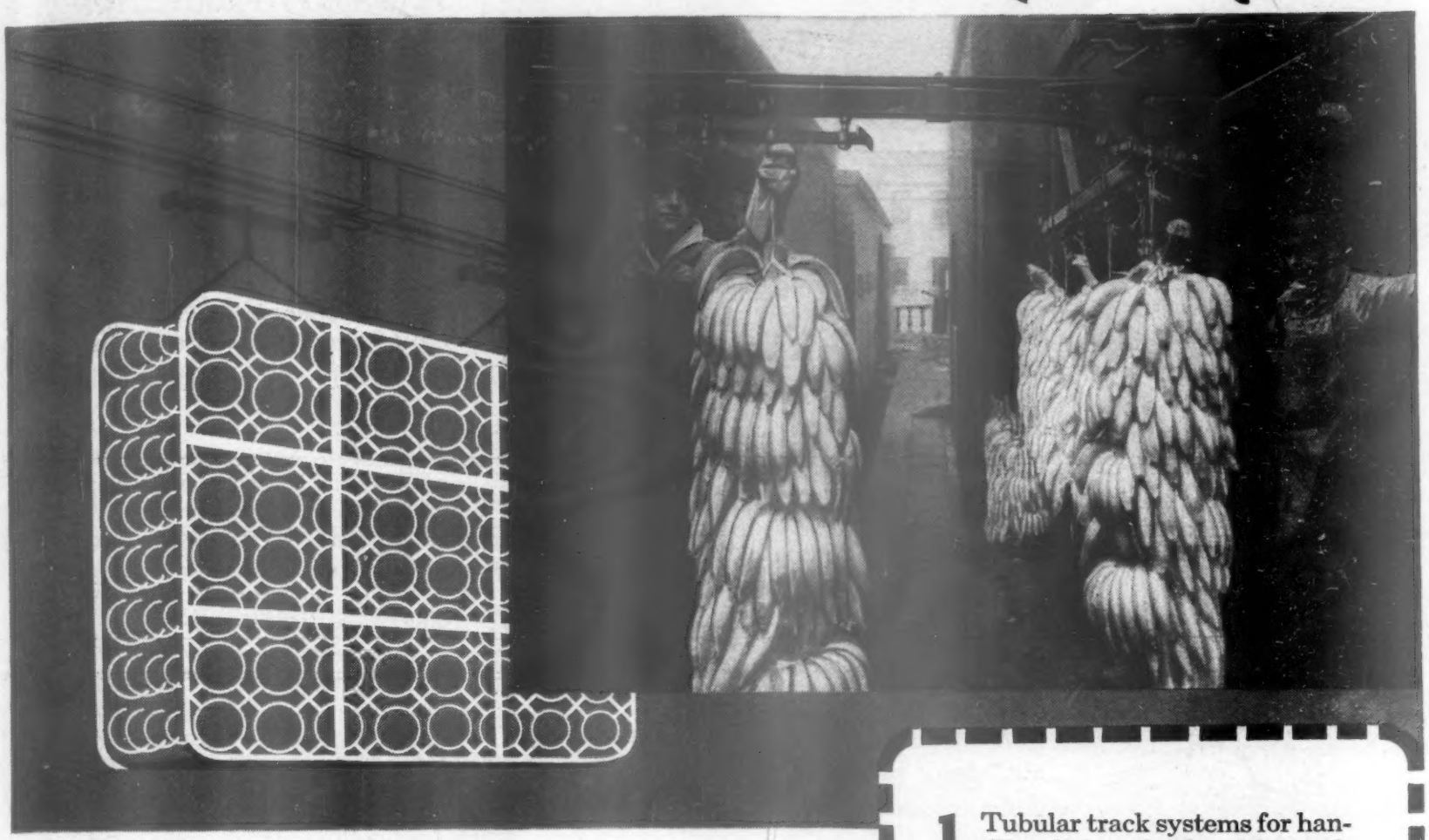
Regulations Division, headed by a superintendent of regulations, was established to centralize the responsibility for editing and distributing regulations manuals and bulletins, as well as all company manuals and certain service bulletins.

The division provides a centralized source of reference for all published company policies and procedures, and serves all parts of the company seeking up-to-date information on regulations. It also serves as a liaison between the operations administration and Civil Aeronautics Administration for the interpretation, publication, and distribution of CAA regulations affecting flight operations.

Work Analysis, under the direction of a superintendent of work analysis, is concerned with analysis of specific problems pertaining to the development of improved methods, procedures, facilities, space utilization for all types of work, and with assistance to other company elements in the application of the principles of job methods. This work is closely associated with other work performed by the economic controls administration.

Since improperly laid out buildings and other facilities can handicap performance of departments, the work analysis division maintains an exceptionally close relationship with the design, buildings, and airports department; it is also responsible for

Bananas or Bed Springs...



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Low production costs require fast, economical movement and handling of materials. That is why so many plants, *of all kinds*, are now using Richards-Wilcox Conveying Equipment. No matter how difficult your handling problem or how unusual the layout, you will find the *right* answer in this outstanding line of overhead conveying equipment.

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3. Zig-Zag Continuous Power Conveyor. For continuous movement of light loads within confined areas, and for handling of products through degreasers, dip tanks, spray booths, baking and drying ovens, etc.

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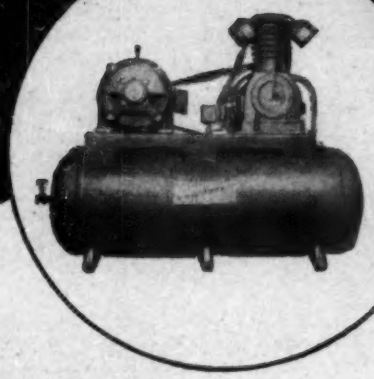
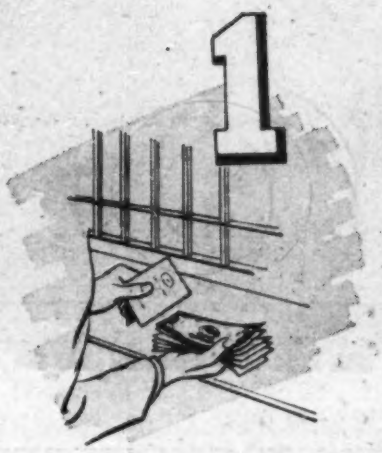
You Save... TWO WAYS with



Kellogg-American

"on-the-spot air"



1

REDUCE LOSSES IN AIR VOLUME AND PRESSURE TO A MINIMUM In only 100 feet of ½" pipe, with five elbows in the line . . . 40% *of the air pressure is lost by friction alone.* Losses from air leaks may increase this loss greatly.

With Kellogg-American "on-the-spot air," long pipelines are eliminated . . . air volume and pressure losses cut to a minimum.

2

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AIR COMPRESSORS GIVE YOU *MORE AIR PER DOLLAR*

More cubic feet of air per kilowatt hour is delivered by Kellogg-American compressors. Overall efficiency is high. Operating costs are low. Compressor life is long and trouble-free.

GET THE FACTS ON HOW MUCH YOU CAN SAVE

Write for your copy of the Kellogg-American "on-the-spot air" folder which tells how you can obtain a survey of your compressed air system. No obligation. *American Brake Shoe Company, Kellogg Division, Rochester 9, N. Y.*

AMERICAN Brake Shoe COMPANY — KELLOGG DIVISION

seeing that functional specifications of buildings and facilities provide for the utilization of the most efficient work methods.

TRAINING PLANNED TO SPUR VOLUNTARY PRODUCTION

W. S. ALLEN, Sales Manager, Winchester Repeating Arms Company, addressing the Conference on Training and Education in Industry

We—business, labor, government, and education—have the common objective of keeping our American system the strong rallying point in a war-weary, discouraged world. To expect people and nations to rally around us, we must be strong ourselves. To be strong ourselves, we must produce more and distribute more goods at a mutual profit for everyone, from the top to the bottom of our social and economic system.

But now, the weariness and discouragement and frustration that have infected many nations, winners and losers alike, have begun to infect us. The disease is contagious and one that may be expected after a major war.

The disease is one of bad thinking. It is the mistaken belief that people should get as much as possible for as little effort as possible. Less effort—less production—less distribution—all add up to a lower standard of living.

The job that brings us together is establishing more harmonious relations between employees and management, to eliminate the foreign class hatred that keynotes discord between employees and management—by establishing an authoritative and impartial source of knowledge and experience on matters that relate to training and education in industry.

It is our hope that all of us together can formulate plans and pool our experience to the mutual benefit from top to bottom of business, labor, government, and education.

SOUND PERSONNEL TECHNIQUES OUTLINED

GUY B. ARTHUR, Jr., Vice-President, Personnel Division, American Management Association

In companies where top management is assuming its rightful responsibility for personnel administration, some notable techniques are evident:

1. A well-developed plan that divides the organizations' tasks into functions and positions. The plan includes for each position a determination of the qualifications necessary for

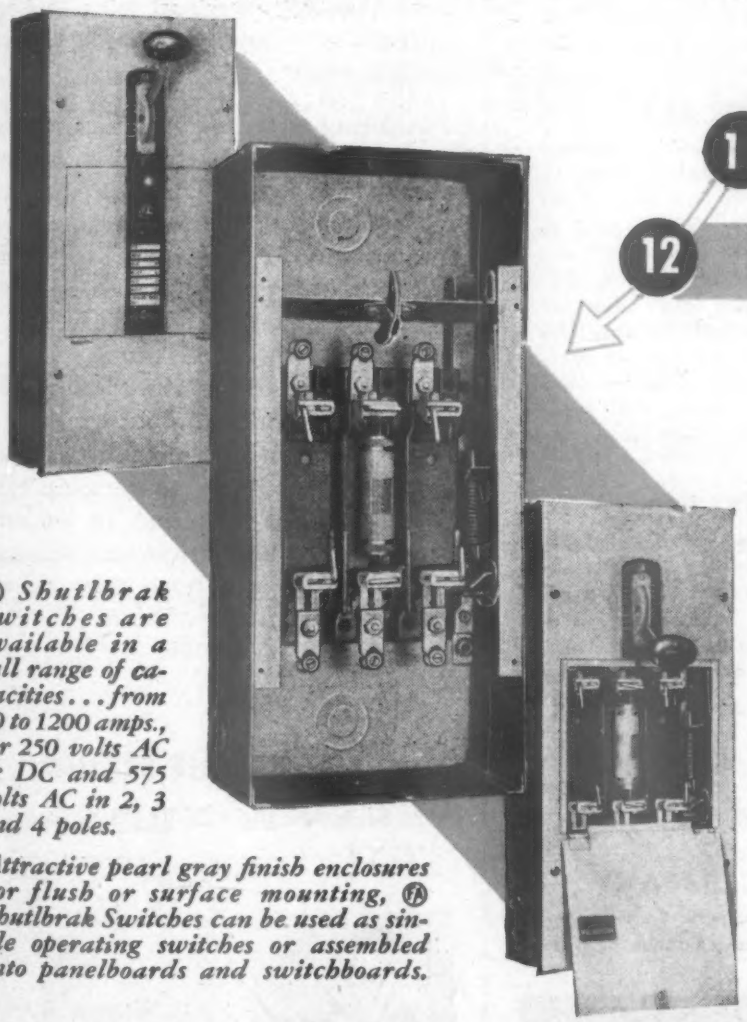
At Least a

Dozen Reasons

WHY YOU'LL LIKE FA SHUTLBRAK ENCLOSED SAFETY-TYPE SWITCHES

There are many reasons for the mounting popularity of FA Shutlbrak Switches. Some say, for instance, they like its easier, split-second speed of operation . . . its new shuttle mechanism feature that gives quick make and break connections. Others say it is the simplicity of design that appeals to them . . . ample knockouts and wiring space at top, bottom and back. Still others say it is its trouble-free service and many practical safety features . . . its long lasting economical operation.

1. Positive Make and Break
2. Interlocking Fuse Doors (With special release)
3. Front Operation
4. Attractive Finish
5. Removable Switch Unit
6. Kamklamp Fuse Holders
7. Full Range of Capacities
8. Silver-Plated Contacts and Connections
9. Ample Wiring Space and Knockouts
10. Silver-Plated Solderless Pressure Connectors
11. Approved by Underwriters' Laboratories
12. Can Be Used Singly or in Panelboard and Switchboard Assemblies



FA Shutlbrak Switches are available in a full range of capacities . . . from 30 to 1200 amps., for 250 volts AC or DC and 575 volts AC in 2, 3 and 4 poles.

Attractive pearl gray finish enclosures for flush or surface mounting, FA Shutlbrak Switches can be used as single operating switches or assembled into panelboards and switchboards.

Whatever the reason, the fact remains that FA Shutlbrak Switches embody the latest in design and construction, making them the popular choice for high quality, heavy duty switching. So the next time you need a good operating switch, ask your dealer to show you an FA Shutlbrak or send for our 20-page Bulletin No. 70.

If it's FA it's "OK"

MAKERS OF . . .
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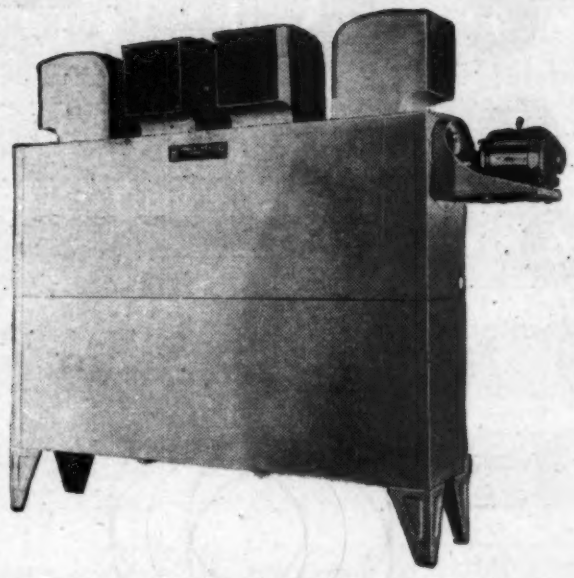
PANELBOARDS
SWITCHBOARDS

Frank Adam
ELECTRIC COMPANY
St. Louis, Missouri

SERVICE EQUIPMENT
SAFETY SWITCHES
LOAD CENTERS
ELECTRIC QUIKHETER

THESE HEAVY DUTY HEATERS *Save Money* FOR LARGE AREA HEATING-



This sturdy Buffalo "Highboy" handles your heating quietly and efficiently.

NOT NEW!

The Buffalo Unit Heaters shown here are all pre-war models. They were designed in the beginning for industrial service, and so far, we haven't seen anything better for that service. Highboys, Lowboys and Breezo-fins—all are in use all over the country—giving efficient, economical heating in factories, warehouses, stores and offices.

NOT RADICAL!

About the design of these units—there's nothing that can be considered a radical innovation. We just draw the air over some copper finned steam coils, good for pressure up to 200 pounds, and deliver it, by means of quiet Buffalo fans, right where you need it. Because the fans and coils are efficient, you get economical heating.

NOT UNIQUE!

There are no "super-gadgets" on Buffalo Unit Heaters. The casings are heavy enough to withstand the handling and usage they can expect, without denting. Ball bearings are amply large, as are fan shafts. Fan rotors are dynamically balanced for continuous quiet operation.

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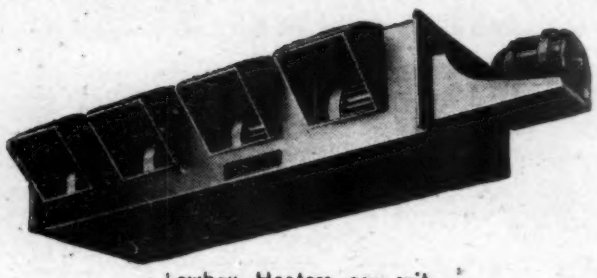
Buffalo Highboy and Lowboy Heaters are made in a complete range of practical sizes, to fit industrial requirements. They may be used as floor-type units, mounted upright on walls or girders, flat suspended under the roof, or suspended inverted. Because the fans will deliver air against duct-resistance, one unit can be used to heat several rooms. Full automatic controls are available for all models.



Lowboy Heaters are suitable for wall or ceiling mounting, same high efficiency as Highboys.

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effective performance, a definition of its responsibilities and duties, the relations of that position to others, and an evaluation of it.

2. Simple clear-cut written statements of policies within which the members of the organization are to accomplish their objective.

3. Emphasis on the importance of good human relations. The golden rule in its most liberal sense is followed by all from the top down.

4. Non-financial satisfactions for each position. Employees have security because the management plans production to avoid fluctuations; because the first thought regarding any transfer, promotion, layoff, or termination is the security of those involved; because promotions are made from within to the most deserving; and because all employees have the freedom to use their own ideas within the limits of policy.

5. Personnel administration controls that quickly point out all sources of employee dissatisfaction. These include absenteeism reports, turnover figures, morale surveys, exit interviews, safety records, experience ratings, grievance statistics, participation reports, training costs.

Another extremely important trend is that of having a top-ranking staff officer in the organization responsible for seeing that sound personnel administration is developed and worked out by everyone in a supervisory capacity. These fellows are on the policy-making level along with the finance and production officers. Their job is to aid management in the writing of company policies; to carry on personnel research; to develop effective appraisal systems; to maintain programs of education and training; and to carry out those services specifically delegated to them.

BEHIND THE BYLINE

Facts About FACTORY'S Authors

Wayne L. Hardesty (page 72) is manager of the Mason City plant of the Belmont Radio Corporation. He has been with the U. S. Radio Television Corporation,

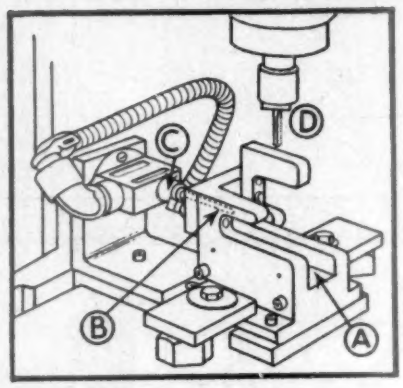
MICRO Precision "SWITCH TRICK" for Shop Use!

Here's How a MICRO Precision Switch Saves Time During Tapping Operations

● The MICRO Precision Switch is used to assure proper positioning for tapping operations. It makes sure a tapping machine will not start unless the work has been properly positioned in the jig. This arrangement is one that can be installed by a maintenance man or plant engineer. It saves many rejects and speeds overall tapping time.

Time Study Men—Foremen—and those responsible for stepped-up production will find that this is only one example of many time-saving operations made possible by the installation of one or more MICRO Precision Switches. One small manufacturer found one hundred and nine places in his plant where MICRO Precision Switches could be used to advantage:

SEND FOR COMPLETE CATALOG that illustrates and describes the many MICRO Precision Switches that are available. Buy them from your nearest distributor—you'll find him listed in the classified section of your phone book in principal cities—or write direct:



How It Works

Part to be tapped is put into jig at "A". As it is moved back, it pushes rod "B" at back of jig, which in turn actuates the switch plunger "C". Then, when the starter button is pushed, tap "D" moves down and performs the tapping operation. Unless the part is properly located in the jig, the tapping operation cannot start.

MICRO Die Cast Enclosed Switch Bottom mounting design

MICRO Precision Switches

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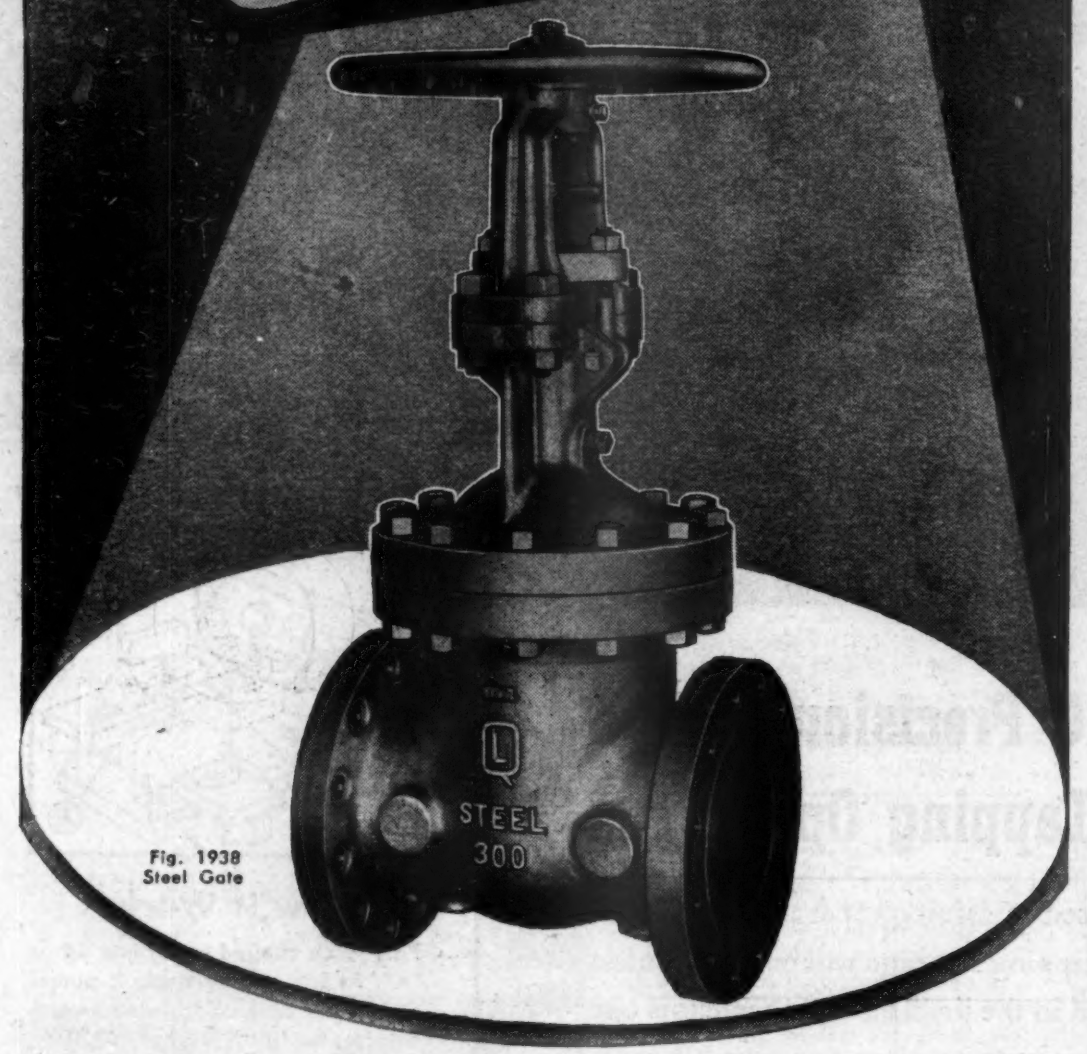

Fig. 1938
Steel Gate

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Many elements in a piping system may contribute to ultimate fuel waste. Insulation may be inadequate. Piping and fittings may be at fault. Or valves may fail to hold tight . . . resulting in leakage of steam, air, or water, and in lowered pressures, all of which may mean excessive fuel consumption.

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Crosley Radio Corporation, General Motors Corporation, Farnsworth Radio-Television Corporation, Robert Ray Kimmell Company, and the Belmont Radio Corporation, working up from production manager to plant manager. He is a member of the Industrial Management Society, National Time-Motion Clinic, and the National Foremen's Institute.

Herbert J. Knell, co-author (page 78), plant engineer for the Wright Aeronautical Corporation's 41½-acre plant at Wood-Ridge, N. J., has been with the organization since June, 1936. After graduating from the Guggenheim School of Aeronautics, New York University, with an M.E. degree, he joined the Wright Company as an engine test observer. Plant engineer for the Wood-Ridge plant during the war, he became plant engineer for the corporation when Wright consolidated all of its operations in Wood-Ridge after the war's end.

E. R. Keast, co-author (page 78), oil and reclaim supervisor at the Wright Aeronautical Corporation, taught the operation of production machines at the Rock Island Arsenal during World War I. Later he set up the New York office of the Micro Westco Company of Bettendorf, Iowa, manufacturers of bread slicing machinery. Keast came to the Wright Company in 1942 to take charge of the firm's petroleum requirements.

Erwin B. Bahnsen has been associated with Victor Mfg. & Gasket Company since 1940. Earlier experience was with Venn-Severin Machine Company in the diesel power plant field on design of diesel engines and design of heavy-duty power plants. Part of his education was gained in Europe and he completed his studies in New York. He is deeply interested in motion pictures and still photography. He plays golf for a lazy

COMPLETE *Finishing* SYSTEMS

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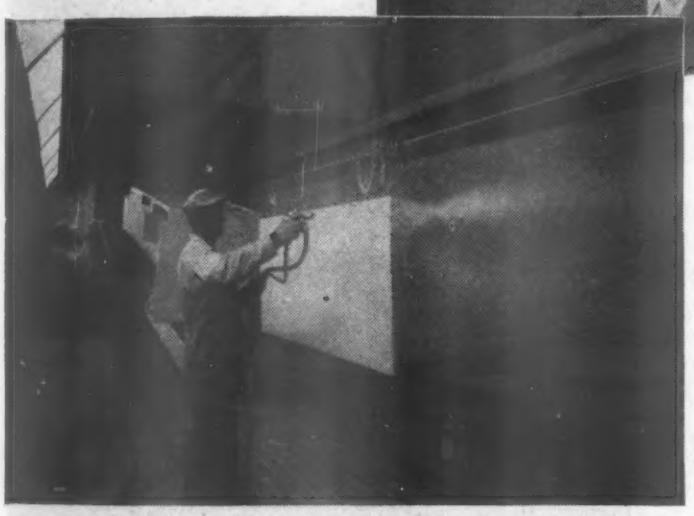
Above: A Large Cold Display Case leaving the Dry-off Oven in the Complete Mahon Finishing System at the Hussmann-Ligonier Plant, St. Louis, Mo. At Right: General view of the Same Installation Showing Diversity of Parts and Products Handled. Note Up-Tunnel to Finish Drying Oven Located on Roof of Plant.



Typical Mahon Hydro-Filter Spray Booths in the Hussmann-Ligonier Installation. Swivel Attachments on Conveyor Line Permit Turning and Painting of Both Sides of Cases Twelve Feet Long. Parts Seven Feet in Height are also Handled in the Same Mahon Spray Booths.

Mahon Finish Drying Oven—Part of the Hussmann-Ligonier Installation—is located on the Roof of the Plant to Conserve Valuable Manufacturing Floor Space.

Mahon Meets Exacting Requirements of Hussmann-Ligonier Company

The Mahon Finishing System illustrated here is an unusual installation due to the wide diversity of sizes and shapes of parts and products handled—and, the requirements of the finishing process being the most exacting in the industry . . . exacting, because of the extreme conditions of grease and humidity under which products like cold display cases serve in butcher shops, and the extreme low temperatures, humidity and corrosive elements ever present in ice cream cabinets in commercial use. It is only natural that the Hussmann-Ligonier Company should turn to Mahon for equipment to meet these exacting requirements in product finish, because, over twenty-five years' experience in this highly specialized field has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon Insert in Sweet's Mechanical Industries File, or

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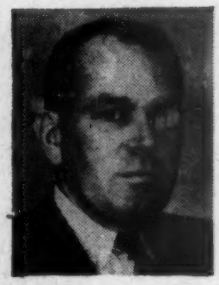
man's diversion and goes for pack horse and hunting trips to the wildest parts of the world. He never misses a chance to plug The Society for the Preservation and Encouragement of Barbershop Quartette Singing in America, Inc., of which he is a baritone member.



Maurice M. Clancy (page 103) graduated from the University of South Dakota in 1928, with a B.S. degree in Civil Engineering. Between 1928 and 1930, he was employed by the state highway departments of Pennsylvania and California and the Petrol Corporation of Los Angeles. His positions with the Ryan Aeronautical Company have included that of safety engineer, assistant to the chief inspector, and manager of the industrial engineering department. Clancy is a member of the Aircraft Safety Council, the American Society of Industrial Engineers, and the National Foremen's Association.

Phillip H. Burkons (page 106), active in the Society for the Advancement of Management, Cleveland Chapter, is now an industrial engineer at the Tapco plant of Thompson Products, Inc. After attending the Case Institute of Technology he worked for eight years as chief die designer at the Cleveland Works of the National Malleable & Steel Castings Company, and as an industrial engineer for the American Steel & Wire Company.

Edmund F. Richardson (page 109) was educated at the California Institute of Technology and the Los Angeles School of Optometry. He has been practicing his profession in Hollywood since 1922. Now serving his second year as president of the American Optometric Association, he has appointed a Committee on Occupational Vision to study means by which optometrists can best serve business and industry.

CONTINUED ON PAGE 258

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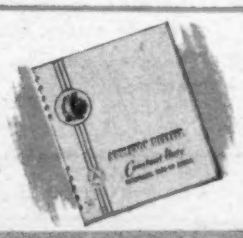


APPLETON
CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

BEHIND THE BYLINE *(continued)*

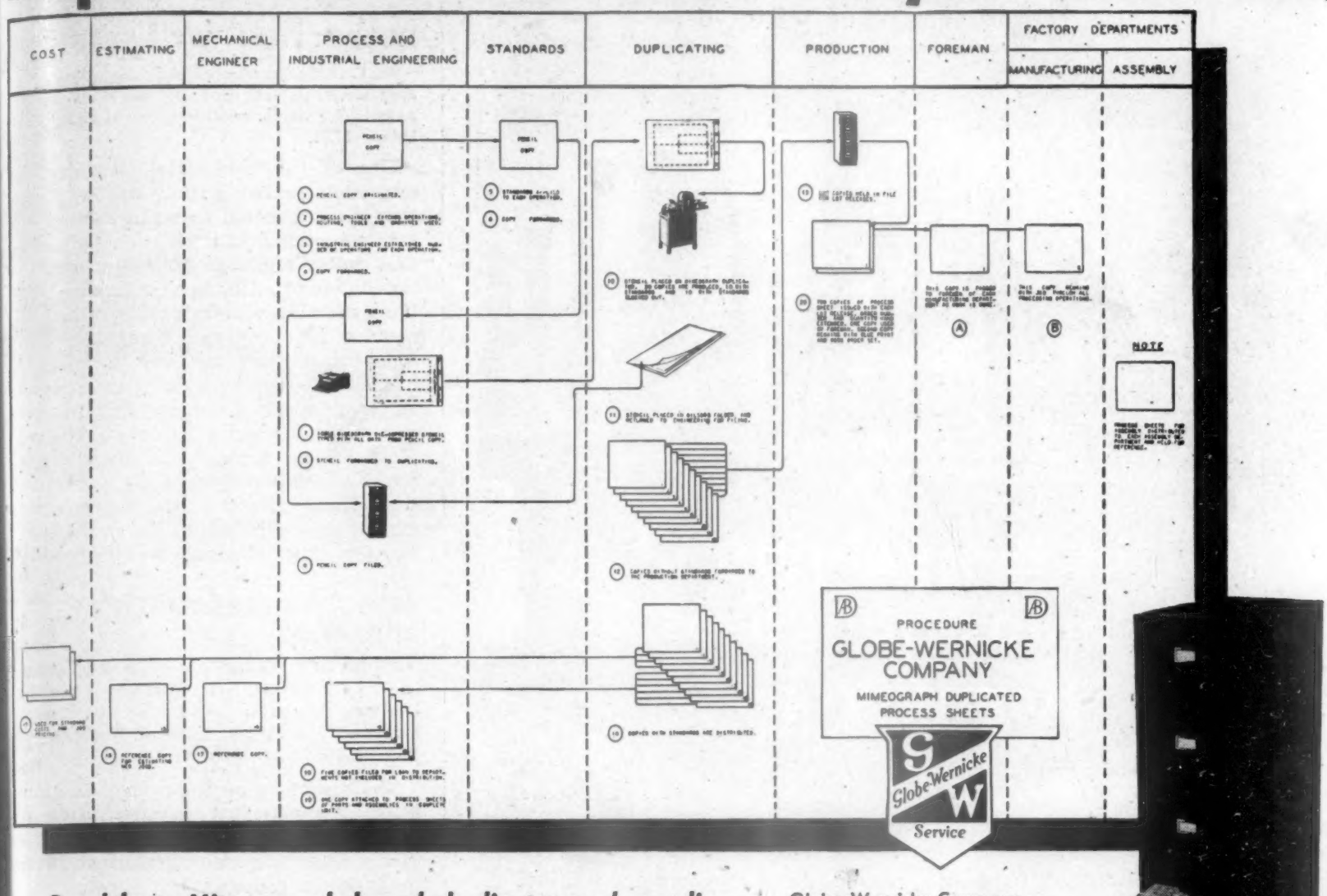
Donald Peddie (page 122) worked for Minneapolis-Moline Power Implement Company in production scheduling and in administration of controlled materials prior to service as an officer in the Quartermaster Corps. Peddie, a graduate of the Harvard School of Business Administration in 1941, rejoined Minneapolis-Moline in 1947. Presently in the systems department, he is surveying production control in the company.

Walter Zeigler (page 124) has spent 27 years of uninterrupted activity in the woodworking industry. He has studied wood technology, furniture designing, and cabinet making. In 1938, he became plant superintendent for the Ed. Roos Company of Forest Park, Ill. As a designer and inventor of labor saving devices, he helped develop round corner veneer work and waterfall construction for mass production.

Aldus Chapin Higgins (page 129), Chairman of the Executive Committee of the Norton Company, Worcester, Mass., holds B.S. and D.Eng. degrees from Worcester Polytechnic Institute and an LL.M. degree from the National University Law School, Washington, D. C. He has been associated with the Norton Company since 1900, when he started as patent counsel, following service as an assistant examiner, United States Patent Office. He was president of the Norton Company from 1933 until 1941. In 1913, he was awarded the John Scott Medal by Franklin Institute for his invention of the electric furnace in which the abrasive, Alundum, is made.

Clair M. Erickson's article (page 70) is his second contributed to FACTORY this year. He is assistant plant superintendent for The Lincoln Electric Company and for three years has been a member of the company's junior board. A Behind the Byline biography appeared in the March issue, page 232.

Paper Work "Flow Chart" Keys Production



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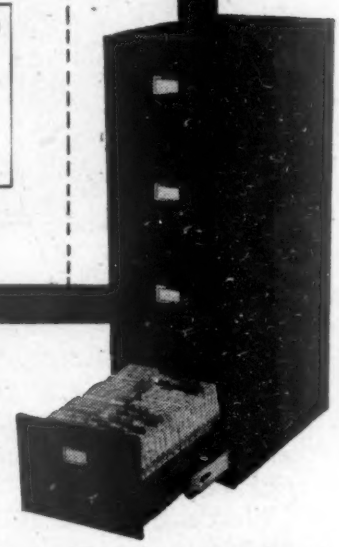

The Globe-Wernicke Company, Cincinnati, makers of office equipment, did a lot of thinking about paper work—and they called in our duplicating experts, too.

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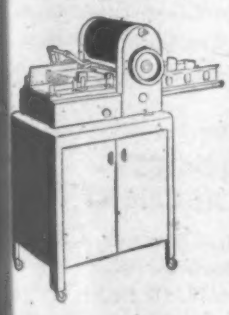

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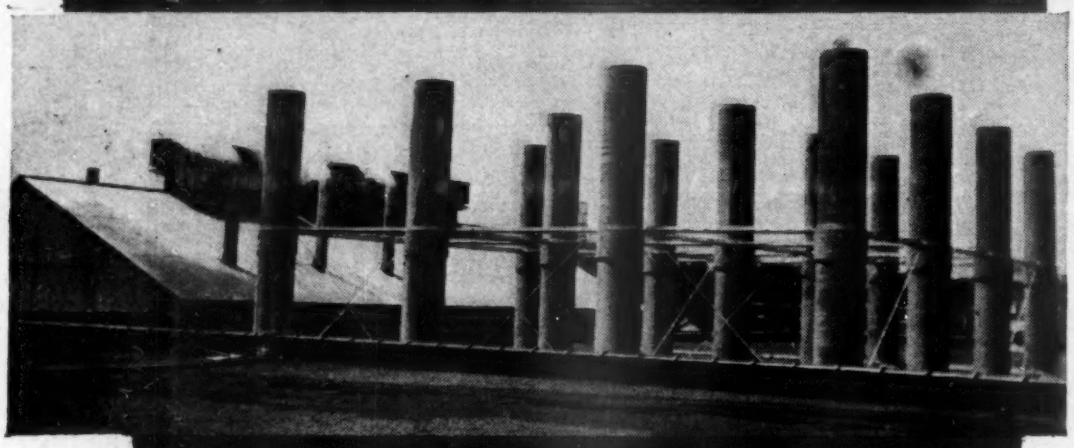

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Boiler Works	Farm Machinery	Leather	Railroad	Soft Drink
Brewing	Food	Meat Packing	Rayon	Sugar Refining
Canning	Foundry	Metal	Refrigeration	Textile
Ceramic	Furnace	Mining	Rubber	Tool
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BOOKS

PRODUCTION WITH SAFETY

A. L. DICKIE, Member A.S.S.E. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 242 pages. Sample forms, charts, list of visual aids, index. $2.50.

One of the "Industrial Organization and Management Series." In play form, this book presents material relating to safety supervision. It tells the story of a new safety engineer outlining his proposed plan of action in a conference with the executive officers of his firm, who counter his proposals with their own opinions. He then outlines the manner in which he took over the job, the report forms used, and a step-by-step description of departmental inspection. The use of dialog all through the book brings out the actual opinions of the foremen in their training classes, and the opinions expressed are based on the author's 21 years of experience as a safety engineer.

EFFECTIVE PERSONALITY BUILDING

GWENYTH R. VAUGHN, Dean of Women, Mexico City University, and **CHARLES B. ROTH,** President, Charles B. Roth & Associates, Denver. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 290 pages. Sketches, index. $2.25.

The problem of improving and rebuilding personality is approached in this book from two points of view. It discusses what constitutes personality, then goes on to consider its improvement, first, from without, by attention to personal habits, traits, and manners, and second, from within, stressing the mental aspects of personality, showing how one can improve one's ability to live harmoniously with others.

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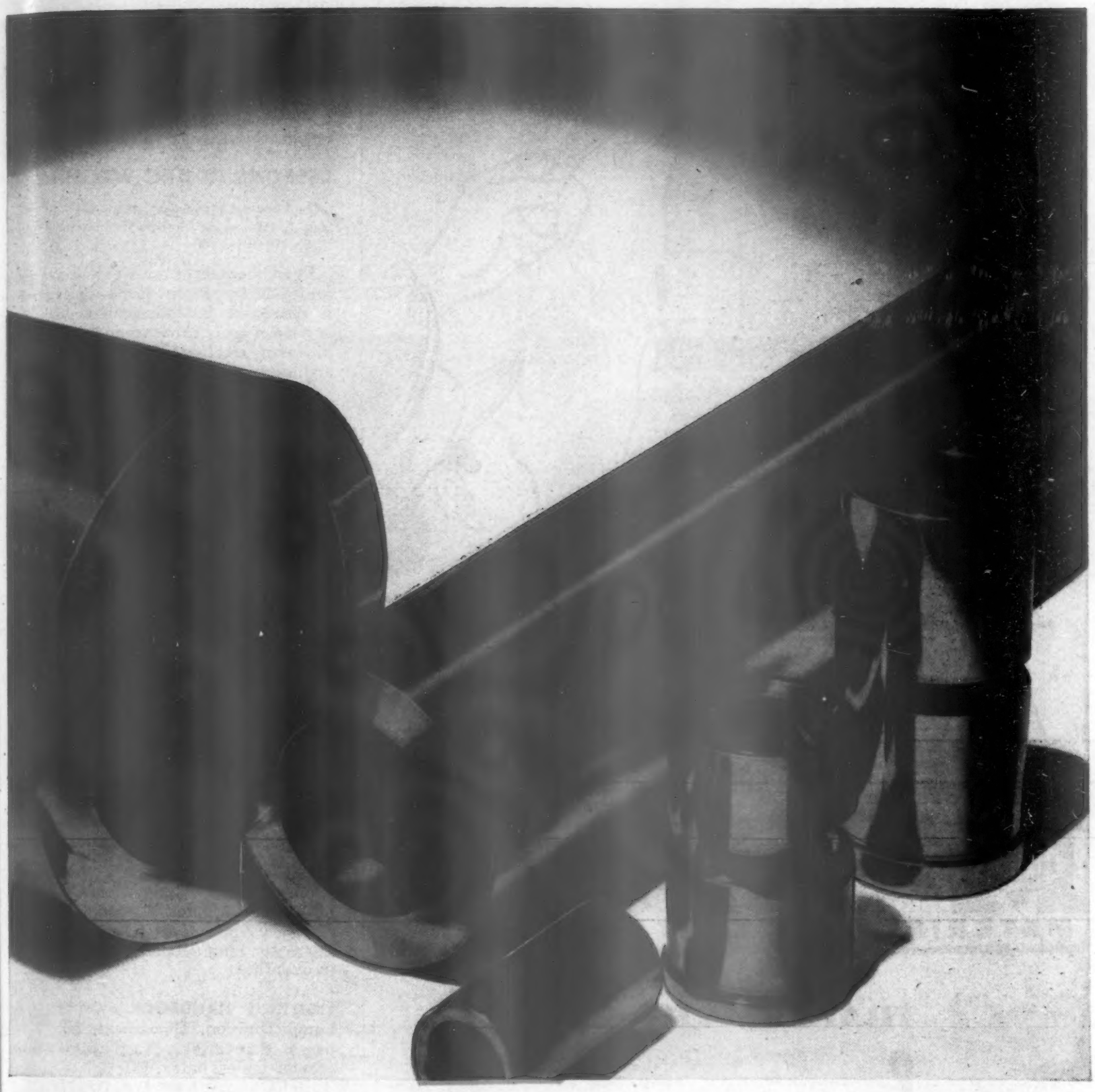
SAMUEL P. BROWN, B. S., P. E. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 644 pages. Photographs, sketches, graphs, charts, tables, appendix, index. $6.

How to calculate heating and cooling loads, how to heat, cool, ventilate, and otherwise condition air, are discussed in this volume. Design of air ducts and liquid piping systems, selection of equipment, and automatic controls are covered, as well as refrigeration theory and its application to specific problems. Tables necessary for elementary design work are included.

MANUAL FOR PROCESS ENGINEERING CALCULATIONS

LOYAL CLARKE, Chemical Engineer, Celanese Corporation of America. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 438 pages. Charts, graphs, formulas, tables, index. $6.

One of the "Chemical Engineering Series," this book summarizes data helpful to engineers in performing calculations in the development of chemical processes. Tables, charts, and equations useful in process engineering are in-



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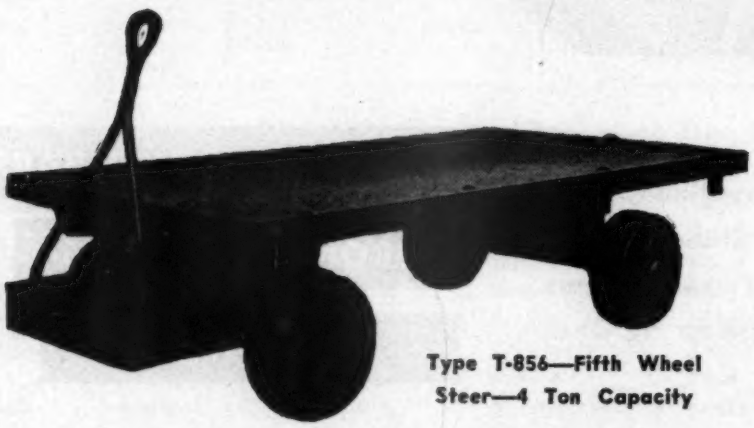

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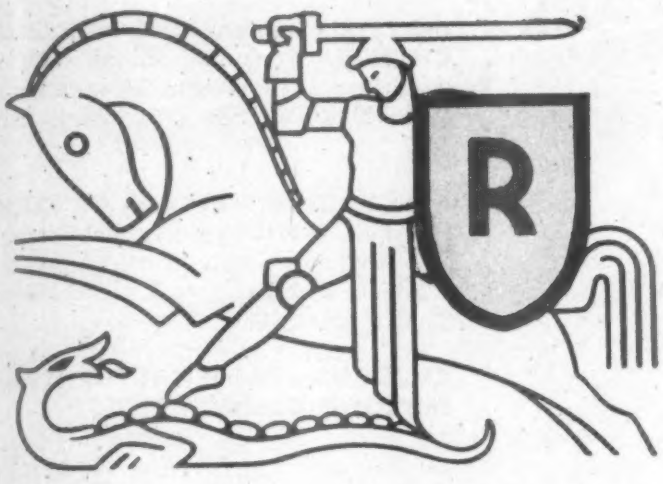

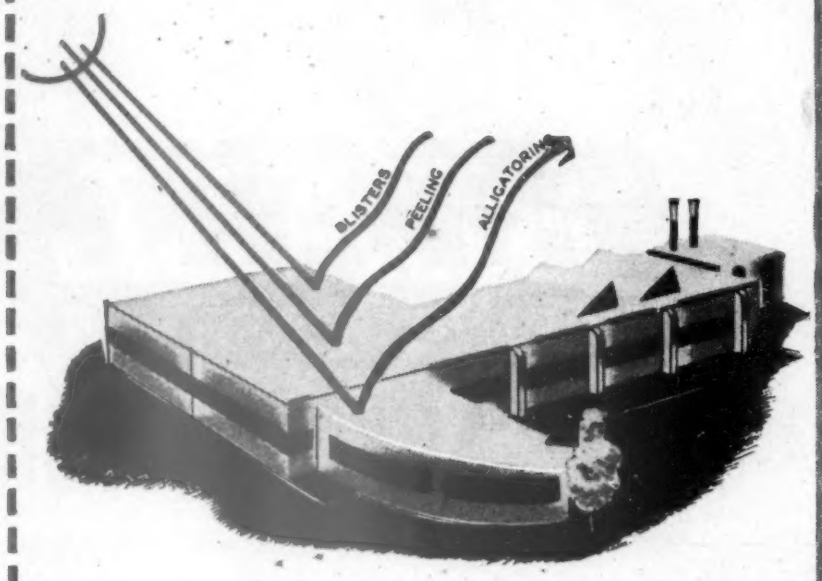

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